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J. C. Branner

DEPARTMENT OF MINES AND AGRICULTURE.

MEMOIRS OF THE GEOLOGICAL SURVEY OF NEW SOUTH WALES.
E. F. PITTMAN, A.R.S.M., GOVERNMENT GEOLOGIST.

PALÆONTOLOGY, No. 6.

DESCRIPTIONS

OF THE

PALÆOZOIC FOSSILS OF NEW SOUTH WALES

(AUSTRALIA),

BY THE LATE

L. G. DE KONINCK, Docteur ès Sciences et en Médecine,
Professeur Émérite à l'Université de Liége, &c.

TRANSLATED FROM THE FRENCH BY

T. W. EDGEWORTH DAVID, B.A., F.G.S., Professor of Geology, University of Sydney; MRS. DAVID; and W. S. DUN, Assistant Palæontologist, Geological Survey of New South Wales.

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Tribrachyocrinus—dissected plates.
Cyathocrinus.

LETTER OF TRANSMITTAL.

Geological Survey Branch,
Department of Mines and Agriculture,
Sydney, 25th January, 1898.

Sir,

I have the honour to submit for publication Memoir No. 6 of the *Palæontological Series* of the Geological Survey of New South Wales, viz., *Descriptions of the Palæozoic Fossils of N.S. Wales*, by the late Professor L. G. de Koninck, M.D., of the University of Liége.

The publication of this work, in French, was completed in 1877, but the necessity for an English translation has long been felt. Some years ago the translation was undertaken by Professor and Mrs. T. W. E. David; but after completing that portion relating to the Carboniferous and Permo-Carboniferous fossils, they were prevented, by the many calls upon their time, from proceeding further with the task. The publication was therefore delayed until, at my suggestion, Mr. W. S. Dun, Assistant Palæontologist to the Geological Survey of N.S.W., undertook to translate the balance of the text.

The advantage of having a translation of this important Memoir made by a skilled Palæontologist is too obvious to need comment; and the thanks of the Department are due to Mr. Dun, as well as to Professor and Mrs. David, for the time and care devoted to it.

I have the honour to be,
Sir,
Your obedient servant,
EDWARD F. PITTMAN, A.R.S.M.,
Government Geologist.

The Under Secretary for Mines and Agriculture.

EDITOR'S PREFACE.

THE late Professor Laurient Guillaume De Koninck's classical work—Recherches sur les fossiles paléozoiques de la Nouvelle-Galles du Sud (Australie)—was published in the years 1876–1877 as part of the *Memoires de la Société royale des Sciences de Liege,* 2nd ser., Vol. II. This work was the description of numerous fossils collected and submitted to De Koninck by the Rev. W. B. Clarke, M.A., F.R.S. The types and named specimens were, after description, deposited in the latter gentleman's collection, and on his death were purchased by the Government of New South Wales. Unfortunately, a few years afterwards, this invaluable collection was destroyed by fire on the burning of the Garden Palace, on September 22nd, 1882.

Parts I and II containing the descriptions of the Upper Silurian and Devonian fossils have been prepared for this edition by me. Part III, relating to the Carboniferous and Permo-Carboniferous fossils, was translated some years ago by Professor T. W. Edgeworth David, B.A., F.G.S., and Mrs. David.

The translation has been made as literal as possible, and the Author's meaning has been closely adhered to. The tables of synonyms preceding the descriptions of previously known forms have been left as De Koninck published them; such corrections or additions as have been thought essential are inserted as foot-notes in square brackets, and are initialled.

W. S. DUN.

Sydney, October, 1897.

INTRODUCTION.

If the scientific interest roused by the numerous discoveries made in Australia during the first half of this century be not as intense at present, this is due mainly to the fact that the natural products of this wonderful country are on the whole pretty well known, and that the public, as well as scientists, have had opportunities to familiarise themselves with the strange form of most of the animals that inhabit it.

Not a Museum of Natural History, not a Zoological Garden, would be worthy of the name if they did not contain at least some specimens of that great series of Marsupials, large and small, and of the birds, noteworthy either by their shape or variety of plumage, that the Australian Region supports, as well as that unique animal whose body is covered by an otter's skin, and whose muzzle is replaced by a bill like a duck's, a fact to which is due the name of *Ornithorhynchus* by which it is generally known.

The living fauna of this country presents this singular character—that it can be compared to no other. Its principal types have no representatives in countries of similar latitudes providing analogous conditions of life.

In Europe it is necessary to go back to the beds of the Great Oolite before we meet with remains of a mammal whose structure is similar to that of the Marsupials of Australia.

This isolation of living races has given rise to theories formed more or less on the formation of the immense continent that these races inhabit. Some are of opinion that its fauna represents the direct descent of that which vanished in Europe with the deposition of the last Jurassic beds, and that the Australian land has remained above water during the different periods in which more recent beds were laid down in the rest of the world.

But the discovery, in Australia itself, of well developed beds belonging to the Cretaceous and Tertiary Systems has demolished this theory; it has proved that the land of this country has not been subject to geological phenomena differing from those that have been observed in all other parts.

The only question that remained to be solved was whether there was, between its fossil fauna and flora and those of other countries, the same difference of form and organisation which characterises so markedly the living fauna and flora.

Professor McCoy has answered this question as far as concerns the Silurian forms he has collected in Victoria; he has found that, with the exception of some new species, they are identical with the English species that characterise the well-known Bala Beds; also he has not hesitated to admit *the general specific identity of the marine fauna of the two hemispheres in the early times of the Palæozoic Era.*[*]

My own observations enable me to confirm the opinion of the learned Director of the Melbourne Museum, as the Reader will be able to see later on. I may add, as well, that I arrive at the same conclusions as far as the Devonian and Carboniferous Systems are concerned; so that one can assert that the Marine Fauna of the entire Palæozoic Era has been subject to the same general conditions.

Then it was thought for some time that the Australian Carboniferous System was totally different from that of other countries.

In fact the first fossils from this important formation brought to Europe by Mitchell, Darwin, and De Strzelecki, having been submitted to the inspection of the leading English Palæontologists, were considered by them as being not only new to science but also as presenting little analogy with those already known from this formation.

The works published in 1847 by McCoy and in 1849 by Dana did not modify this opinion much. The material that these learned palæontologists had at their disposal was not sufficient and had not been collected with sufficient knowledge of the country to admit of a comparison, deductions from which would be beyond doubt.

I hope to be able to prove, in the following pages, that the majority of Australian Carboniferous forms have, in Europe or in America, if not identical representatives at any rate other forms very closely allied and analogous. It is a noteworthy fact that a great number of the Australian species attain a size to which the same species occurring in Europe and America rarely reach. The same remark is also applicable to some Indian and Chinese Carboniferous forms, which have probably developed under equally favourable conditions.

To arrive at the result I have just mentioned has necessitated the exceptional circumstances under which I have been placed; I have been fortunate in having at my disposal large quantities of material collected over a great extent of country and accumulated during more than thirty years work, at a cost of untold fatigue, of great danger and sacrifices of all kinds, such as only an ardent love of science in him to whom these treasures belong —the Rev. W. B. Clarke—has been able to render endurable with courage and patience.

---

[*] Notes sur la Zoologie et la palæontologie de Victoria, p. 34, 1866.

In paying homage to his devotion I fulfil a debt of gratitude that assuredly all who have at heart the progress of Geology and Palæontology will appreciate.

Mr. Clarke in submitting to me the Palæozoic Fossils collected through his diligence in New South Wales, has wished to verify his own observations and establish undeniably their correctness by a means he has no fear of employing even at a distance of five thousand leagues from the country explored by him, at the time when by an inconceivable distortion of meaning, some geologists have disdained to make use of them, although having them at their hand, to arrive more surely and quickly at a methodical classification of the formations, the elucidation of which had been entrusted to them.

So as to attain his object more surely, Mr. Clarke has taken care to influence me in no way, and to furnish me with no information beyond that which concerns the locality of the occurrence of each specimen.

He has thus left me quite free to form my opinions, and I have had as a sole clue to this labyrinth of the varying forms submitted to my examination the ideas acquired at the cost of a long experience and thorough and conscientious studies to enable me to group them and refer them to each of the main Palæozoic Systems to which they belong.

This experience was all the more necessary in the present case, when the greater portion of the species are preserved only as impressions or casts, and without it I should have found myself in the most hopeless confusion.

In making these observations I am far from pretending that all my specific determinations are quite correct and free from error; in this respect I am the first to admit that I have many doubts on account of the imperfect state of the specimens examined by me. Nothing, however, is opposed to to the fact that, by the exact knowledge of the relations of shape and organization, one is able to recognise definitely the horizon of each of these specimens.

In putting these ideas into practice I have been able to convince myself that about a third of the species examined and represented by more than a thousand specimens belong to the Silurian and Devonian, and that the greater portion of the remaining two-thirds belong to the Carboniferous System. I think I should state that I take all the responsibility for the determination of the species described or recorded, as well as for the conclusions deduced from their study and set forth later on.

No general work on the Silurian and Devonian fossils of Australia has appeared up to the present. Professor McCoy has published a list of a number of species observed by him in the Silurian beds of Victoria,[1] and Dr. Bigsby has recorded them in the important work to which he has with justice given the title "Thesaurus Siluricus," and there has added some others that have been reported to him by Salter;[2] Mr. R. Etheridge, junior, has recently published some observations on the Graptolites of the Lower Silurian Rocks of Victoria.[3] The Carboniferous fossils on the other hand have been the subject of interesting memoirs by Messrs. J. D. and G. Sowerby, Lonsdale, Morris, McCoy, Dana, A. d'Orbigny, and lastly Mr. R. Etheridge.[4]

These various works, the titles of which will be found in the footnote, have been of great help in my own work. It should be noted also that Professor McCoy's Memoir that appeared in 1847 was based on material sent by the Rev. W. B. Clarke to Professor Sedgwick of Cambridge; in this way one gains proof positive of the considerable time this indefatigable Geologist has already given to the study to which he is whole-heartedly devoted, and which has gained him the honour of sharing with Sir Roderick Murchison the honour of foretelling the discovery of auriferous deposits in Australia long before it was realised.[5]

---

[1] Exposition intercoloniale, 1866. Notes sur la zoologie et la paleontologie de Victoria, in 8vo. Melbourne.

The Rev. J. E. Woods mentions only *Pentamerus oblongus* as having been found about thirty miles to the south of Adelaide. Geological Observations in South Australia, 1862, p. 20.

Ann. Mag. Nat. Hist., 1874.

(1) T. J. Mitchell, Three Expeditions into the Interior of Eastern Australia. 2 vols., 8vo, 1838 (Fossils by J. D. Sowerby).

(2) Darwin, Volcanic Islands (fossils by G. Sowerby).

(3) McCoy, On the Fossil Botany and Zoology of the Rocks associated with the Coal of Australia (Ann. Mag. Nat. Hist., 1847, xx (1), p. 145).

(4) Dana, Geology of the U. S. Exploring Expedition during the years 1838–1842, under the command of Ch. Wilkes. 4to, with Atlas in folio, 1849.

(5) J. Grange, Géologie et mineralogie du voyage au pôle sud et dans l'Oceanie, sous le commandement de J. Dumont d'Urville. 2 vols. in 8vo, with Atlas, fol., 1848–1854 (fossils by A. d'Orbigny)

(6) R. Etheridge, Description of the Mesozoic and Palæozoic Fossils of Queensland (Quart. Journ. Geol. Soc. 1872, xxvi, p. 317).

[5] Woods, Geological Observations in South Australia, p. 4.

Before concluding, a word of explanation as to the method adopted in my work appears necessary.

It would have been advisable that all the specimens collected by the Rev. W. B. Clarke should have been figured; by this means it would have been easy to check my determinations, but circumstances over which I have no control not admitting of this, I have confined myself to giving a description of them. This description will be very short in the case of species already known, and the identity of which I have no doubt. It will consist chiefly in giving the essential characters of each of them, and will be accompanied by a reference to the Author who first recorded them, to him who may have studied it most thoroughly and given the best figures of it, and if necessary to him who has described its stratigraphical position best. It is therefore to the works of these authors that it will be necessary to refer to complete the details I have been compelled to omit, so as not to extend beyond limit a work the principal aim of which is to assist in determining as exactly as possible the relative age of the different palæozoic rocks of New South Wales. As to the new species, I intend to define them as exactly as the state of the specimens will allow me; I will insist mainly on the characters in which they differ or resemble their already known congeners, so as to render their confusion with these impossible.

PART I.

SILURIAN SPECIES.

Division—PROTOZOA.

Class—RHIZOPODA.

Order—SPONGIDA.

The sponges, which belong to the lowest division of the Animal Kingdom, have but few representatives in Palæozoic deposits, particularly as compared with the great number found in the Jurassic and Cretaceous Systems and also in recent seas. For a long time but few Silurian species of this order have been known; most were classed with *Scyphia*.

For some years now, through the researches of F. Roemer, Billings, and several other Palæontologists, we have known of some very interesting genera of these animals that made their appearance before the deposition of the Lower Silurian beds in which they have left their remains. Amongst these genera nowadays are usually classed those that Goldfuss has described as *Stromatopora*.

Genus—STROMATOPORA, *Goldfuss*.

STROMATOPORA STRIATELLA, *A. d'Orbigny*.

Stromatopora concentrica, Lonsdale, 1839, in Murchison's Silurian System, pl. 15, fig. 31, 31a and 31d (non Goldfuss).

„ ***striatella***, A. d'Orbigny, 1850, Prodr. Pal., t. 1, p. 51.

„ „ Salter, 1859, in Murchison's Siluria, p. 532, pl. 41, fig. 31.

This species is easy to recognise by the thinness of the numerous concentric lamellæ of which the mass is made up and by the considerable development in length that these lamellæ may attain. It is by this character particularly that it is distinguished from *Stromatopora concentrica*, Goldfuss, with which it has been confounded, because it has somewhat the same form; but the layers of the second form are relatively thicker, and the tubes that traverse them have a greater diameter.

Horizon and Localities.—On the banks of the Bell (Bell River) in a grey limestone with bright fracture; and in the alluvial workings of Tuena and Limokilns [Limekilns] between Wattle Flat and Bathurst. It has been found in England, Wales, Russia, Bohemia, Canada, and in the United States.

Class—**ACTINOZOA.**

Order—**RUGOSA.**

Genus—STROMBODES, *Schweigger.*

STROMBODES DIFFLUENS, *Milne Edwards and J. Haine.*

Acervularia baltica (pars), Lonsdale, 1839, in Murchison's Silurian System, pl. 16, fig. 8 and 8*a* (*cæteris exclusis*).

Strombodes diffluens, Milne Edwards and J. Haime, 1851, Polyp. Foss. Terr. Pal., p. 431.

„ „ Milne Edwards and J. Haime, 1852, Mon. Brit. Foss. Corals, p. 294, pl. 91, fig. 2.

Arachnophyllum typus, Salter, 1859, in Murchison's Siluria, pl. 39, fig. 8 and 8a (*cæteris exclusis*) non McCoy.

Among the numerous fossils that were sent to me by Mr. Clarke I have found only a single specimen of this species, but its characters agree so perfectly with those described by Milne Edwards and Haime that I have no doubt as to its identity with the specimens which served as those Authors' types. The form of the calices and the number of septa is identical with those of the English specimens.

Horizon and Localities.—This species was collected at Manuro, on the banks of the Berudba (Berudba River), in a deep olive-coloured slate which weathers on exposure, and is covered with a thin layer of brown ochreous material. It is accompanied by two impressions that appear to me to have been formed by a *Heliolites*, the species of which is undeterminable.

Genus—PTYCOPHYLLUM, *Milne Edwards and J. Haime.*

PTYCOPHYLLUM PATELLATUM, *Schlotheim.*[1]

Fungites patellatus, Schlotheim, 1820. Petrefaktenkunde, I, p. 247.

Strombodes plicatus, Lonsdale, 1839, in Murchison's Silurian System, p. 691, pl. 16 bis, fig. 4.

Ptycophyllum patellatum, Milne Edwards and J. Haime, 1852, Mon. Brit. Foss. Corals, p. 291, pl. 67, fig. 4.
„ „ Salter, 1859, in Murchison's Siluria, p. 534, pl. 38, fig. 4.

Coral short, pedicellate, epitheca ridged, calice very everted and with laminated margins, resembling somewhat a mushroom in form. Small pseudocolumella; central cavity pretty deep; septa alternately varying a little, thick at base and thin at the ends, where the larger ones are strongly bent and rise a little at the centre; about a hundred in number.

Horizon and Localities.—This species has been found in the Upper Silurian of England, Ireland, and Gothland. Mr. Clarke has found it at Dangelong, in the Cooma District, in a psammite coloured a deep red by oxide of iron.

Genus—CYSTIPHYLLUM.

CYSTIPHYLLUM SILIURENSE, *Lonsdale.*

Cystiphyllum silurense (pars), Lonsdale, 1839, in Murchison's Silurian System, p. 691, pl. 16 bis, fig. 1.
„ „ Milne Edwards and J. Haime, 1852, Mon. Brit. Foss. Corals, p. 298, pl. 72, fig. 1.
„ „ Lonsdale, 1859, in Murchison's Siluria, p. 533, pl. 38, fig. 1.

Although I have been to examine only one fragment of this *Cystiphyllum,* its form and characters agree so perfectly with those of specimens described and figured by the Authors whose works I have quoted, that I have no hesitation in referring it to the same species.

Horizon and Localities.—This species has been found in the Upper Silurian of Wenlock in England; of Andann and of Cong, in Ireland, as well as Reval and Pavlowsk in Russia. The Australian specimen is in a matrix of quartzite reddened by oxide of iron, from Burrawang to the east of Molong.

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[1] [It is almost certain that this is *Mucophyllum crateroides,* the type of a new genus, differing widely in internal structure from *Ptycophyllum.* See ETHERIDGE, R., Junr., Description of a proposed New Genus of Rugose Coral (*Mucophyllum*). Records Geol. Survey N. S. Wales, 1894, IV, pp. 11-18, pls. 3 and 4.—W.S.D.]

Genus—OMPHYMA, *Raffinesque and Clifford.*

OMPHYMA MURCHISONI ? *Milne Edwards and Haime.*

Cystiphyllum silurense (pars), Lonsdale, 1839, in Murchison's Silurian System, p. 691, pl. 16 bis, fig. 2 (*cœteris exclusis*).

Omphyma Murchisoni, Milne Edwards and J. Haime, 1851, Polyp. Foss. Terr. Pal., p. 402.

" " *Id. Id.*, 1852, Mon. Brit. Foss. Corals, p. 289, pl. 67, fig. 3.

" " Salter, 1859, in Murchison's Siluria, p. 534, pl. 38, fig. 2.

I am not quite certain that the specimen submitted to me really belongs to the species to which I have referred it, because it is only an external cast, of which, however, the resemblance to the individual figured by Milne Edwards and J. Haime is striking. As in the last-mentioned, it is composed of two adjoining branches.

Horizon and Localities.—Quartzite of Burrawang.

Genus—CYATHOPHYLLUM, *Goldfuss.*

CYATHOPHYLLUM ARTICULATUM, *Wahlenberg.*

Madrepora articulata, Wahlenberg, 1821, Nova Acta Soc. Upsala, VIII, p. 87.

Cyathophyllum vermiculare, Hisinger, 1837, Leth. Suecica, p. 102, pl. 29, fig. 2.

" *articulatum*, *Id.*, 1837, *Ibid.*, p. 102, pl. 29, fig. 4.

" *cæspitosum*, Lonsdale, 1839, in Murchison's Silurian system, p. 690, pl. 16, fig. 10.

" *articulatum*, Milne Edwards and J. Haime, 1852, Mon. Brit. Foss. Corals, p. 282, pl. 67, fig. 1.

" " Salter, 1859, in Murchison's Siluria, p. 533, pl. 38, fig. 10.

This coral is fasciculate, and composed of subcylindrical corallites, close set. These are characterised by their contractions and succeeding well-marked swellings; they are covered with a very thin epitheca, which makes the costæ very noticeable and accentuates the little depressions with which they are ornamented; these septa, about sixty in number, are alternately a little thinner the one than the other. The corallites are from twelve to fifteen centimetres long, and are from one to 1·5 centimetres in diameter.

Horizon and Localities.—I have no doubt about the determination of this species, which has been found in Europe in the Upper Silurian of Dudley, Gothland, and Esthonia, and in Australia in the quartzite of Burrawang.

Order—TUBULOSA.

Genus—AULOPORA, *Goldfuss.*

AULOPORA FASCICULATA, *L. G. de Koninck.*

Pl. I, fig. 1.

The coral consists of two sets of corallites, having at the base a common point of origin, and growing obliquely to right and left in the shape of a capital V, with the exception that the inner angular portion is occupied equally by several individuals whose growth has been stopped in about mid-height. Corallites creeping, attached along their entire length, cylindrical, calice oval, but little prominent; their diameter is only two-thirds of a millimetre, and the entire length of the coral is not more than a centimetre and a half.

Relations and Differences.—This species is easily distinguished from all those known up till now by its form and the small size of the corallites.

Horizon and Localities.—One piece of compact yellowish grey limestone, on which is a complete specimen and part of another, has been found on the bands of the Bell (Bell River). The same rock contains an example of *Monticulipora pulchella*, Milne Edwards and J. Haime. I am convinced that both these species belong to the Silurian, because they are associated with *Orthis canaliculata*, Lindström and *Plasmopora petaliformis*, Lonsdale, which are forms found only in that System.

Order—TABULATA.

Genus—SYRINGOPORA, *Goldfuss.*

SYRINGOPORA SERPENS ? *Linnæus.*

Tubipora serpens, Linnæus, 1767, Syst. Nat., ed. xii, p. 1271.

Aulopora serpens, Lonsdale, 1839, in Murchison's Silurian System, p. 675, pl. 15.

„ *conglomerata*. *Id.*, 1839, *Ibid.*, p. 675, pl. 15, fig. 9 (*non* Goldfuss).

Syringopora serpens, Milne Edw. and J. Haime, 1852, Mon. Brit. Foss. Corals, p. 275, pl. 62, fig. 2.

„ „ Salter, 1858, in Murchison's Siluria, p. 534, pl. 41, fig. 6 and 9.

Good specimens of this species prove that while young it is creeping, and resembles an *Aulopora*, and that afterwards the corallites straighten and extend slightly irregularly; they then form a somewhat close bundle, the different branches of which are connected by a few transverse tubes. The diameter of the corallites seldom exceeds a millimetre.

Although most of these characters, except the first mentioned, obtain in the specimen before me, I cannot say positively that it belong to Linnæus' species, as it consists only of a piece of compact argillaceous rock, on which there has been preserved the external impression of some number of corallites.

Formation and Locality.—The specimen of which I have just been speaking was found on the banks of the Delegate River. As well as the imprint of *Syringopora,* it contains impressions of *Strophomenes pecten* and *Atrypa reticularis.* There is no doubt that it is Silurian.

Genus—HALYSITES, *Fischer de Waldheim.*

HALYSITES ESCHAROÏDES, *Lamarck.*

Catenipora escharoïdes, Lamarck, 1816, Hist. Anim. sans Vertébres, t. ii, p. 207.

Tubipora catenulata, S. Woodward, 1830, Syn. Table Brit. Org. Rem., p. 5.

Halysites escharoïdes, Fischer de Waldheim, 1837, Oryct. Gouv. Moscou, p. 164, pl. 38, fig. 3.

" " Milne Edwards and J. Haime, 1852, Mon. Brit. Foss. Corals, p. 272, pl. 64, fig. 2.

This coral is easily recognised by the chain-like network of its upper surface; one can seldom see more than two or three corallites forming one of the sides of this net; calices elliptical, longer axis measuring from one to two millimetres.

Horizon and Locality.—Only one specimen of this species has been found in a hard slightly grey siliceous rock at Wellington. The upper surface only of the coral is visible; all the rest has disappeared. This species belongs to the Upper Silurian, and has been found in England, Sweden, Russia, and North America.

Genus—MONTICULIPORA, *A. d'Orbigny.*

1. MONTICULIPORA ? BOWERBANKI, *Milne Edwards and J. Haime.*

Favosites spongites, Lonsdale, 1839, in Murchison's Silurian System, p. 683, pl. 15 *bis*, fig. 8c, 8d, 8e (*cæt. excl., non Cal. spongites*, Goldf.)

Monticulipora ? Bowerbanki, Milne Edwards and J. Haime, 1858, Mon. Brit. Foss. Corals, p. 268, pl. 63, fig. 1.

Alveolites Labechei, Salter, 1859, in Murchison's Siluria, p. 532, pl. 40, fig. 8, 8d, 8e (*cæt. excl.*, non Milne Edwards and J. Haime).

This species is very variable in form. The surface is often gibbous or mammillated; calices sloped, margins thin, slightly unequal, generally somewhat lozenge-shaped; they are about a millimetre in diameter.

Note.—The only specimen of this species sent to me shows the impression only of a pretty well developed individual. The specific characters I have just mentioned are easily seen in it, so that I have little doubt as to the identity of the specimen.

Horizon and Locality.—In England in the Dudley limestone, and in Australia in a compact argillaceous rock, schistose and of ochreous colour at Rock Flat Creek, to the east of Monaro.

2. MONTICULIPORA PULCHELLA, *Milne Edwards and J. Haime.*

Chætetes pulchellus, Milne Edwards and J. Haime, 1851, Polyp. Foss. Terr. Pal., p. 271.

Monticulipora pulchella, *Idem*, 1852, Mon. Brit. Foss. Corals, p. 267, pl. 52, fig. 5.

Coral ramose, branches often compressed, long diameter varying from five to ten millimetres. The calices are small, unequal, and usually subhexagonal in form.

Horizon and Locality.—This species, which occurs in the Silurian limestone of Dudley and Wenlock, has been found in a specimen of greyish, very compact limestone from the banks of the Bell River.

Genus—ALVEOLITES, *Lamarck.*

1. Alveolites repens, *Fougt.*

Millepora repens, Fougt., 1749, Amœn. Acad., I, p. 99, pl. 4, fig. 25.

  ,,   *ramis vagis, Idem, Ibid.*, p. 98, pl. 4, fig. 14.

  ,,   *repens,* Lonsdale, 1839, in Murchison's Silurian System, p. 688, pl. 15.

Alveolites repens, Milne Edwards and J. Haime, 1851, Polyp. Foss. Terr. Pal., p. 258.

  ,,   ,,   *Idem*, 1852, Mon. Brit. Foss. Corals, p. 263, pl. 62, fig. 1.

  ,,   ,,   Salter, 1859, in Murchison's Siluria, p. 53, pl. 42, fig. 30.

Coral ramose, composed of rather slender and often joining branches. Calices very small, and little broader than long, outer lip a little hollowed out in the middle.

I have been able to compare the only specimen of this species sent to me with specimens from Gothland, and have thus been able to satisfy myself as to their undoubted identity.

Horizon and Locality.—This species is common in the Upper Silurian of England and Sweden. In Australia it is more rare in the mottled quartzite of Burrawang.

2. Alveolites rapa, *L. G. de Koninck.*

Pl. I, fig. 2.

Coral in a thin layer, corallites very inclined, small, walls not perforate; calices round, oblique, deep, and provided with very thin and indistinct septa; diameter about a millimetre; the thickness of the external border not being very regular, the arrangement of the corallites cannot be investigated any more.

Relations and Differences.—The general form and arrangement of the corallites in this species resembles that of *Alveolites Fougti,* Milne Edwards and J. Haime. Nevertheless it is readily distinguishable from that species by the small size of the calices and complete absence of mural pores.

Horizon and Locality.—One specimen of this species was collected by Mr. W. B. Clarke at Burrawang, in a reddish quartzite.

Genus—STRIATOPORA, *Hall.*

STRIATOPORA AUSTRALICA, *L. G. de Koninck.*

Pl. I, fig. 33a.

This little coral has the form of a small cylindrical branch bifurcating towards the middle, but one of the two accessory branches has been broken off; the surface is ornamented with little granulations, scarcely visible to the naked eye; it is also penetrated by some number of sub-oval openings corresponding to tubes directed obliquely from above downwards towards the centre of the coral; these openings, comparatively large, are arranged in quincunx over the whole surface of the coral; each is surrounded by a small, circumscribed, smooth space, except at the lower portion, where it is narrowed. The diameter is only two millimetres; that of the openings, which may be considered the calices, is only half a millimetre. I have not seen any septa.

Relations and Differences.—This species has some resemblance to *Striatopora flexuosa*, J. Hall[1]; it differs from it in the granulated surface and the absence of septa in the calices.

Horizon and Locality.—A single specimen of this interesting species was collected from a dark grey limestone near Yass, on the banks of the Murrumbidgee.

Genus—FAVOSITES, *Lamarck.*

1. FAVOSITES CRISTATA, *Blumenbach.*

Madreporites cristatus, Blumenbach, 1803, Comment. Soc. Scient. Gött., XV, p. 154, pl. 3, fig. 12.

Calamopora polymorpha, Lonsdale, 1839, in Murchison's Silurian System, p. 684, pl. 15, fig. 1.

Favosites cristata, Milne Edwards and J. Haime, 1850, Polyp. Foss. Terr. Pal., p. 242.
„ „ *Idem,* 1852, Mon. Brit. Foss. Corals, p. 260, pl. 61, f. 3 and 4.
„ „ Salter, 1858, in Murchison's Siluria, p. 533, pl. 40, fig. 2.

Coral usually composed of several more or less remote cylindrical branches having a diameter of six to eight millimetres. Calices slightly unequal, subcircular, a little oblique. This arrangement is due to the oblique disposition of the corallites grouped round the axis of the branches.

Horizon and Localities.—This species, which has often been confused with *F. polymorpha,* Goldf., is found in the Silurian of England, Ireland, Gothland, and Russia. Mr. Clarke has found only one specimen in the quartzite of Burrawang.

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[1] Palæontology of New York, ii, p. 156, pl. 40B, fig. 1.

2. Favosites Forbesi, *Milne Edwards and J. Haime.*

Favosites gothlandica, Lonsdale, 1839, in Murchison's Silurian System, p. 682, pl. 15 bis. fig. 3 and 4 (*non* Goldf.)
,, *Forbesi,* Milne Edwards and J. Haime, 1851, Polyp. Foss. Terr. Pal., p. 238.
,, ,, *Idem,* 1852, Mon. Brit. Foss. Corals, p. 275, pl. 60, fig. 2.
,, *gothlandica,* Salter, 1858, in Murchison's Siluria, p. 533, pl. 40, fig. 3 and 4 (*non* Goldf.)

Coral of variable shape, often in rounded masses or more or less gibbous, but little elevated. It is peculiar in the inequality of the calices, of which the largest have a diameter of about two millimetres, and are usually surrounded with some number of small ones of a diameter seldom less than half a millimetre. Walls thin, tabulæ horizontal but unequally spaced.

Horizon and Localities.—This species, which is fairly common in the upper beds of the Silurian of England, Ireland, and Sweden, does not seem to be less common in Australia, where it occurs in the quartzite of Burrawang, to the west of Molong.

3. Favosites aspera, *A. d'Orbigny.*

Favosites alveolaris, Lonsdale, 1839, in Murchison's Silurian System, p. 681, pl. 15 *bis*, fig. 42 (*non* Goldf.)
Favosites aspera, A. d'Orbigny, 1850, Prod. Pal., I, p. 49.
,, ,, Milne Edwards and J. Haime, 1852, Mon. Brit. Foss. Corals, p. 257, pl. 60, fig. 3.
,, *alveolaris,* Salter, 1859, in Murchison's Siluria, p. 553, pl. 40, fig. 1, 2 (*non* Goldf.)

Coral massive, composed of a large number of slightly diverging corallites, which are fairly long and with convex surface. Calices unequal, although all having almost the same diameter. Tabulæ horizontal and equidistant; mural pores arranged along the angles of the corallites. Mean diameter of the calices about two millimetres.

Horizon and Localities.—It is not uncommon in the Silurian of England, Sweden, and Russia. In Australia it has been found in a white limestone at Boree, and in a greyish limestone at Calalamine.

4. FAVOSITES MULTIPORA ? *Lonsdale.*

Favosites multipora, Lonsdale, 1839, in Murchison's Silurian System, p. 683, pl. 15 *bis*, fig. 5.
" " Milne Edwards and J. Haime, 1852, Mon. Brit. Foss. Corals, pl. 258, pl. 60, fig. 4.

The calices in this coral are almost equal to one another, and are fairly regularly arranged in the form of slightly elongated hexagons about a millimetre in diameter.

Horizon and Localities.—I am not quite certain that the single specimen from Burrawang submitted to me, and which I refer to this species, really belongs to it; however, I am acquainted with none other to which it approaches more closely.

5. FAVOSITES FIBROSA, *Goldfuss.*

Calamopora fibrosa, var. *tuberoso-ramosa,* Goldfuss, 1829, Pretref. Germ., I, p. 82, pl. 28, fig. 3*a*, 3*b* (*cæt. excl.*)

Alveolites fibrosa, Lonsdale, 1839, in Murchison's Silurian System, p. 68, pl. 15 bis, fig. 1, and 15 bis, fig. 6.

Favosites fibrosus, Milne Edwards and J. Haime, 1853, Mon. Brit. Foss. Corals, p. 297, pl. 6, fig. 5.

Stenopora fibrosa, Salter, 1859, in Murchison's Siluria, p. 534, pl. 40, fig. 6, and pl. 41, fig. 1.

Coral cylindrical, pyriform, or composed of several branches, either isolated or adjacent. Corallites radiating from the centre towards the surface, straight or slightly curved; tabulæ close together, with a series of mural pores on the angles of the corallites. Diameter of the calices averaging half a millimetre.

Horizon and Localities.—According to Milne Edwards and Haime this species occurs in the Lower and Upper Silurian and in the Lower Devonian. A single specimen has been collected in a greyish limestone at Limekilns, between Wattle Flat and Bathurst.

6. FAVOSITES GOTHLANDICA, *Fougt.*

Corallium gothlandicum, Fougt, 1749, Linnæus, Amoen. Acad., I, p. 106, pl. 4, fig. 27.

Favosites gothlandica, Lamarck, 1816, Hist. Anim. sans Vertèbres, ii, p. 206.

Calamopora gothlandica, Goldf., 1829, Petref. Germ., t. i, p. 78, pl. 26, fig. 3*a*, 3*e* (*cæt. excl.*)

Favosites gothlandica, Lonsdale, 1845, in Strzelecki's Phys. Descr. N. S. Wales, p. 266.
„ „ Milne Edwards and J. Haime, 1852, Mon. Brit. Foss. Corals, p. 256, pl. 60, fig. 1.

Corallum a more or less rounded mass, sometimes elongated; calices sub-equal, usually hexagonal. Tabulæ almost horizontal, equidistant. Mural pores surrounded by a small ridge, arranged in two rows along the face of each wall. Average diameter of the calices two and a half millimetres.

Horizon and Localities.—This is one of the most common forms of the Silurian Formation. It appears to occur in both Upper and Lower Silurian rocks. In Australia it is not uncommon in the quartzite of Burrawang. M. de Strzelecki has collected specimens of it on the Yass Plains.

Genus—PROPORA, *Milne Edwards and J Haime.*

PROPORA TUBULATA, *Lonsdale.*

Porites tubulata, Lonsdale, 1839, in Murchison's Silurian System, p. 687, pl. 16, fig. 3.

Astrospora tubulata, A. d'Orbigny, 1850, Prodr. Pal., I, p. 50.

Palæspora „ McCoy, 1851, Brit. Pal. Foss., p. 18.

Propora „ Milne Edwards and J. Haime, 1851, Polyp. Foss. Terr. Pal., p. 224.

„ „ *Idem*, 1852, Mon. Brit. Foss. Corals, p. 255, pl. 59, fig. 3.

Heliolites tubulatus, Salter, 1858, in Murchison's Siluria, p. 534, pl. 39, fig. 8.

This coral is usually an irregularly rounded mass, often gibbous and formed of colonies superimposed one upon the other. The calices are circular with projecting margins slightly ridged by the septa, which are usually twelve in number. Tabulæ close; cœnenchyma abundant and vesicular.

Horizon and Localities.—This species is found in the Upper Silurian beds of England, Gothland, and Bohemia. A very good, free, silicified specimen has been found on the banks of the Bell (Bell River).

Genus—PLASMOPORA, *Milne Edwards and J. Haime.*

PLASMOPORA PETALIFORMIS, *Lonsdale.*

Porites petaliformis, Lonsdale, 1859, in Murchison's Silurian System, p. 687, pl. 16, fig. 4.
Palæopora ,, McCoy, 1851, Brit. Pal. Foss., p. 17.
Plasmopora ,, Milne Edwards and J. Haime, 1852, Mon. Brit. Foss. Corals, p. 253, pl. 59, fig. 1.
Heliolites ,, Salter, 1859, in Murchison's Siluria, p. 534, pl. 39, fig. 4.

Corallum hemispherical or sublenticular, and protected by an epitheca with concentric folds. Calices circular, subequal, and through the presence of septa having a star-like appearance; septa twelve, prolonged almost to the centre of the calice. Tabulæ fairly close.

Horizon and Localities.—In the Upper Silurian of England and Ireland; a small well-preserved specimen was found with the preceding species on the banks of the Bell.

Genus—HELIOLITES, *Dana.*

1. HELIOLITES MEGASTOMA, *McCoy.*

Porites pyriformis (pars), Lonsdale, 1839, in Murchison's Silurian System, p. 686, pl. 16, fig. 2*d* and 2*e* (*cæt. excl.*)
,, *megastoma,* McCoy, 1846, Sil. Foss. Ireland, p. 62, pl. 4, fig. 19.
Palæopora ,, *Idem,* 1851, Brit. Pal. Foss., p. 16, pl. 1c, fig. 4.
Heliolites ,, Milne Edwards and J. Haime, 1852, Mon. Brit. Foss. Corals, p. 251, pl. 58, fig. 2.
,, *interstinctus,* Salter, 1859, in Murchison's Siluria, p. 533, pl. 39, 2*d* and 2*e*, (*cæt. excl.*)

Corallum branching, irregularly rounded, calices circular, two or three millimetres in diameter, and without prominent edge to the margins. Cœnenchyma little developed; cells cubical and fairly regularly arranged in numerous rows. Walls thin; tabulæ numerous and close.

Horizon and Localities.—I have seen only a few specimens of this species in the quartzites of Burrawang. In England and Ireland it occurs in the upper beds of the Silurian.

2. Heliolites Murchisoni, *Milne Edwards and J. Haime.*

Compound turbinated madrepora, Parkinson, 1820. Organic Remains, II, p. 69, pl. 7, fig. 10.

Palæopora interstincta, var. *subtubulata,* McCoy, 1851, Brit. Pal. Foss., p. 16, pl. 1*c*, fig. 2.

Heliolites Murchinsoni, Milne Edwards and J. Haime, 1851, Polyp. Foss. Terr. Pal., p. 215.

" " *Idem,* 1852, Mon. Brit. Foss. Corals, p. 250, pl. 57, fig. 6.

This coral consists of larger or smaller masses, variable in outline, but usually very gibbous. Cœnenchyma is very abundant, and the calices are pretty far apart. They are small and not deep. When well preserved, twelve septa are present; the tabulæ are not always regularly spaced; they are often a little oblique to the axis of the calice. The cœnenchyma is composed of the assemblage of a large number of small-chambered, fairly regular tubes.

This species has often been confused with Linnæus, *H. interstinctus*, from which it is, however, distinguished by the distance apart of the calices.

Horizon and Localities.—Some good specimens of this species were found with the preceding; it has been recorded from the Silurian limestone of Wenlock, in England, and of Gothland, in Sweden.

Division—MOLLUSCOIDEA.

Class—BRACHIOPODA.

Genus—CHONETES, *Fischer de Waldheim.*

Chonetes striatella, *Dalman.*

Orthis striatella, Dalman, 1827, Kongl. Akad. Handl., p. 111, pl. 1, fig. 1.

Leptæna lata, Von Buch, Abhandl. Akad. K Wissensch. Berlin, pp. 53 and 70, pl. 3, figs. 1, 3, 5–9, 14, 15,

Chonetes striatella, L. G. de Koninck, 1847, Mon. Genre *Chonetes*, p. 200, pl. xx, fig. 5.

" " Davidson, 1871, Mon. Brit. Sil. Brach., p. 331, pl. 49, figs. 23–26.

Having given a very detailed description of this species in my *Monographie des Chonetes*, I consider it needless to dilate upon its characters, which agree perfectly with those of the Australian specimen I have before me. The general form of this specimen and the nature of its ribs are identical with those of European specimens. I have no doubt about the determination of this species.

Horizon and Localities.—This *Chonetes* is very widespread in the upper beds of the Silurian of Europe and North America. Mr. Clarke has collected it in a compact slate from near Quedong, which is very analogous to some rocks in the Dudley District.

Genus—LEPTÆNA, *Dalman.*

1. LEPTÆNA QUINQUECOSTATA, *McCoy.*

Orthis quinquecostata, McCoy, 1846, Sil. Foss. Ireland, p. 33, pl. 3, fig. .
Leptæna ,, *Idem*, 1852, Brit. Pal. Foss., p. 236.
,, ,, Salter, 1859, in Murchison's Siluria, p. 211, fig. 3.
,, ,, Davidson, 1871, Mon. Brit. Sil. Brach., p. 322, pl. 48, fig. 23–27.

This little shell is perfectly recognisable when well preserved by means of the three, five, or seven small radiating ribs with which its surface is ornamented. These ribs spring from the umbo, are almost equidistant, very thin and distinct from the other ornamentation of fine longitudinal striations.

Mr. Clarke has collected but a single specimen of this small species, and again this is an internal cast of the ventral valve; but the specific characters I have just mentioned are so plain, that I do not think I am mistaken in the determination. To these characteristics are added those with which McCoy has made us acquainted, and which consist in the slight extent of the muscular impressions, of oval form and arranged on either side of the umbo, very oblique in reference to the longitudinal axis of the shell, and scarcely a millimetre long.

Horizon and Localities.—In a greyish limestone at Yarralumla, associated with *Strophomenes pecten*, Linn., and *Retzia Salteri*, Davidson. McCoy in the first instance discovered it in Ireland; since then it has been recorded from Scotland and Russia.

2. LEPTÆNA COMPRESSA, *J. de C. Sowerby.*

Orthis compressa, J. de C. Sowerby, 1839, in Murchison's Silurian System, pl. 22, fig. 12.

Strophomena compressa, J. Phillips and Salter, 1848, Mem. Geol. Survey Gt. Britain, II, p. 379.

" " Salter, 1859, in Murchison's Siluria, p. 100, fig. 7, and pl. 9, fig. 16.

" " T. Davidson, 1871, Mon. Brit. Sil. Brach., p. 311, pl. 46, fig. 7–10.

Shell wider than long, subsemicircular or subrectangular. Ventral valve feebly but fairly regularly arched; area narrow, fissure small and covered by a pseudodeltidium. Dorsal valve almost flat or slightly concave. Surface ornamented with a great number of small radiating ribs.

Dimensions.—Length, twenty-two millimetres; breadth, thirty millimetres.

Horizon and Locality.—This species is usually associated with *Atrypa hemispherica,* and they have both been found at Duntroon.

Genus—STROPHOMENES, *Rafinesque.*[1]

1. STROPHOMENES PECTEN, *Linnæus.*

Anomia pecten, Linnæus, 1767, Syst. Nat., Ed. XII, I, pars. ii, p. 1152.

Strophomena pecten, Davidson, 1871, Mon. Brit. Sil. Brach., p. 304, pl. 43, fig. 1–11

This species is easily recognised by its semicircular outline, by the compression and slight convexity of the valves, and by the ornamentation of their outer surface. This ornamentation consists of a large number of radiating ribs, at first fairly equal to one another, but as the shell grows one or two new ribs are developed between the first, and make these appear thicker, thus producing, in relief, a very marked alteration. On good specimens these ribs are traversed by delicate growth-lines.

Horizon and Localities.—This species is very abundant in the upper beds of the Silurian, and has been found in beds of that age in Sweden, Norway, England, Ireland, the Urals, and America. The Australian specimens have been collected in some numbers in the yellow or brownish shales of Yarralumla, Duntroon, and Dangelong.

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[1] [Now written *Strophomena*.—For reasons for this change see Hall and Clarke, Pal. N. York, 1892, viii, Pt. 1, pp. 248 252. W.S.D.]

2. STROPHOMENES RHOMBOIDALIS, *Wilckens.*

Conchita rhomboidalis, Wilckens, 1769, Nachr. v. Seltenen Verstein., p. 77, pl. 8, fig. 43, 44.

Strophomenes rugosa, Rafinesque, 1820.

Strophomena rhomboidalis, T. Davidson, 1871, Mon. Brit. Sil. Brach., p. 281, pl. 39, fig. 1–21.[1]

It appears useless to me to dilate, in this work, upon the specific characters of this shell, which is so well-known and wide-spread throughout Palæozoic rocks. I will confine myself to saying, what appears to be almost generally admitted, that it served Rafinesque as a type for the genus *Strophomenes,* the last syllable of which has been wrongly altered. It is likely that this change is due to the rarity of the works of this Author, of which a part were published in loose pages, which in consequence leads to the difficulty of consulting them and controlling the original spelling of the name.

Horizon and Locality.—This species, which in Europe appears to pass from the Caradoc, through the Llandovery, Ludlow, and the Devonian up to the Lower Carboniferous beds, is very rare in the Upper Silurian of Australia. Mr. Clarke has sent me a single specimen in the condition of an internal cast in a brownish shale from Rock Flat Creek.

3. STROPHOMENES FILOSA (?), *J. de C. Sowerby.*

Orthis filosa, J. de C. Sowerby, 1839, in Murchison's Silurian System, pl. 13, fig. 12.

Strophomena filosa, Salter, 1848, Mem. Geol. Survey Gt. Britain, II, p. 380.

„ „ *Idem,* 1859, in Murchison's Siluria, pl. 20, fig. 2.

„ „ Davidson, 1871, Mon. Brit. Sil. Brach., p. 307, pl. 44, fig. 14–20.

As I have before me only one badly preserved specimen, it is impossible to assert that it agrees exactly with the species under whose name I have placed it; but as, on the other hand, I have found no other *Strophomenes* with which it agrees more closely in its characters, I feel justified in giving it this name provisionally. In any case it cannot be confused with *Strophomenes pecten,* from which it differs in the form of its ribs and cardinal process, and in the muscular impressions which are much more developed.

Horizon and Locality.—The specimen I have just mentioned occurs in an olive-grey shale, which contains internal casts only. It has been collected on the banks of the Murrumbidgee, near Yass.

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[1] For Synonymy *see* Davidson's Monograph.

Genus—PENTAMERUS, *Sowerby.*

1. PENTAMERUS KNIGHTII, *Sowerby.*

Pentamerus Knightii, Sowerby, 1813, Min. Conch., I, p. 73, pl. 28, fig. 1.
,, *Aylesfordii, Idem, id., Ibid.*, I, p. 75, pl. 28, fig. 2 and pl. 29, fig. 1–3.
,, *Knightii,* Davidson, 1871, Mon. Brit. Sil. Brach., p. 142, pl. 16, fig. 1–3, pl. 17, fig. 1–10, et pl. 19, fig. 3.

The form and the characters of this species are so well known, and it has been so well described and so copiously illustrated by my learned friend, Mr. Davidson, that it appears to me to be needless to enter into details about it.

I will confine myself to saying that several varieties of it have been collected by Mr. Clarke. One of these resembles that figured by Davidson in his Pl. xvii, Fig. 7; another has considerable analogy to his Figure 4, and a third with Figure 5 of the same plate. Part of a large individual showing the internal septa is so like the specimen shown in Pl. xvi, Fig. 5, that one would take a part of this figure to be a drawing of this fragment. Consequently, there can be no doubt about the determination of this species.

Horizon and Localities.—This species is not uncommon in the Upper Silurian of England, Scotland, Ireland, Bohemia, and Russia. Many specimens have been collected in Australia, at Calalamine, in a greyish limestone, and in a white limestone from the Canobolas.

2. PENTAMERUS OBLONGUS, *J. Sowerby.*

Pentamerus laevis, J. Sowerby, 1813, Min. Conch., I, p. 76, pl. 28, fig. 3.
,, *oblongus,* J. de C. Sowerby, 1839, in Murchison's Silurian System, pl. 19, fig. 16.
,, ,, Salter, 1859, in Murchison's Siluria, p. 544, pl. 8, fig. 1–4.
,, ,, T. Davidson, 1871, Mon. Brit. Sil. Brach., p. 151, pl. 18, fig. 1–12, et pl. 19, fig. 1, 2.

This species, generally oval in form and with quite smooth surface when young, is very variable when adult. The ventral valve is divided in two by a median septum, which occupies two-thirds of the length of the valve, and which serves as a support for the dental plates. The dorsal valve also has two

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[1] [*Vide* ETHERIDGE, R., JUNR.—The Pentameridæ of New South Wales. Records Geol. Survey of N. S. Wales, 1892, iii, pp. 49–60, pls. 10, 11.—W.S.D.]

longitudinal septa, separated from one another by a slight space, and which support two oblique plates corresponding to the plates placed in a V-shape in the opposite valve.

Horizon and Localities.—This species is very abundant in the Silurian beds of Llandovery, and there sometimes forms entire deposits to the exclusion of all other fossils. It is found in England, Ireland, Scotland, America, and Russia. In Australia it is found in a brownish shale, containing innumerable internal and external casts of *Atrypa reticularis*, Linné, which has been collected at Duntroon. One of the specimens contains, besides the two species I have mentioned, specimens of *A. hemisphærica*, Sow., and of *Strophomenes compressa*, Sow., species that are selected by Sir Roderick Murchison as being the most characteristic of those occurring in the upper beds of the Llandovery (Llandovery Rocks). There cannot then be the least doubt as to the geological horizon of the rock that has yielded these specimens.

Genus—ORTHIS, *Dalman.*

3. ORTHIS CANALICULATA, *Lindstrom.*

Orthis orbicularis, Schmidt, 1859, Beitrag zur Geologie der Insel Gothland, p. 44 (non Sowerby).

„ *canaliculata*, Lindström, 1860, Ofvers. K. Vet. Akad. Forhandl., No. 8, p. 268, pl. 16, fig. 10.

„ „ Davidson, 1871, Mon. Brit. Sil. Brach., p. 218, pl. 27, fig. 12–13.

Shell transversely oval, widest towards the middle; hinge line much shorter than the transverse diameter of the valves; cardinal angles rounded, front slightly sinuated, ventral valve moderately convex, slightly depressed laterally; the area is triangular and hollowed like a canal; dorsal valve much less convex than the ventral, it would appear almost flat were there not in the median portion a fairly well marked sinus which extends from the beak to the margin, and divides it into two equal parts. The surface of both valves is covered by a great number of small ribs increasing either by bifurcation or by interposition, and crossed, particularly towards the margin by concentric growth striæ, slightly regular, but easily seen by the naked eye.

Dimensions.—Length, eleven millimetres; breadth, fifteen millimetres; breadth, fifteen millimetres; and thickness, four millimetres.

Horizon and Localities.—Lindström, who was the first to distinguish this species from *O. elegantula* and *basalis* of Dalman to which it is allied, found it at a great many localities in Gothland. Mr. T. Davidson has found it at Sedgley, near Wolverhampton. Mr. Clarke's specimen comes from the banks of the Bell, and it is associated with *Monticulipora pulchella*, Milne Edw. and J. Haime, in a greyish limestone.

Genus—ATRYPA, *Dalman.*

ATRYPA RETICULARIS, *Linnæus.*

Anomia reticularis, Linnæus, 1767, Syst. Nat., ed. xii, p. 1152.

Atrypa „ Dalman, 1827, Vet. Akad. Handl., p. 127, pl. 4, fig. 2.

„ „ Davidson, 1871, Mon. Brit. Sil. Brach., p. 129, pl. 14, fig. 1–22 (see the synonymy of this species on the same page).

The description of this species has been done so thoroughly and its form is so well known that I can dispense with giving the former or reproducing the second. No Palæontologist can be mistaken in its determination.

Among the numerous specimens I have before me some belong to the Silurian and the others to the Devonian. The first are usually represented only by internal or external impressions, in a rather soft yellowish or brownish shale, belonging to the Upper Silurian rocks of Llandovery age, as I said before. These specimens were collected at Duntroon.

2. ATRYPA ? HEMISPHÆRICA, *J. de C. Sowerby.*

Atrypa hemisphærica, J. de C. Sowerby, 1839, in Murchison's Silurian System, p. 637, pl. 20, fig. 7.

Leptocœlia hemisphærica, J. Hall, 1857, Rept. Regents State Cabin at N. York, p. 33.

Atrypa „ Salter, 1859, in Murchison's Siluria, p. 100, fig. 4, and pl. 9, fig. 3.

„ „ Davidson, 1871, Mon. Brit. Sil. Brach., p. 136, pl. 13, fig. 23–30.

This little species, suborbicular in shape, usually a little broader than long, has the two valves unequally arched. The ventral valve is hemisphærical, pretty regularly arched; the beak is small, pointed, in-curved, and open [perforate]. The dorsal valve is almost flat and slightly depressed towards the middle. The surface of each of these valves is ornamented with from twelve to eighteen radiating ribs, separated from one another by furrows of equal size and crossed by concentric growth striations.

Observation.—I have followed the example of my learned friend, Mr. T. Davidson, in keeping, provisionally, this species under the genus ***Atrypa***, until its characters should have been better defined. Mr. J. Hall is of opinion that it should come under his genus *Leptocœlia*.[1]

Horizon and Localities.—This species is characteristic of the upper beds of the Llandovery; it is rarer in the lower beds. It is very common in some localities, and is found in England, Scotland, Ireland, and America. In Australia it occurs at Duntroon.

Genus—RETZIA, *King.*

RETZIA SALTERI, *Davidson.*

Terebratula Bouchardii, Davidson, 1848, Bull. Soc. Géol. France, V. (2), p. 332, pl. 3, fig. 33.

Terebratula Salteri, *Idem*, 1848, *Ibid.*, V, p. 331, pl. 3, fig. 31.

Retzia Bouchardii, Salter, 1859, in Murchison's Siluria, p. 250, fig. 4.

„ ***Salteri***, var.? ***Bouchardii***, Davidson, 1871, Mon. Brit. Sil. Brach, p. 127, pl. 12, fig. 26 and 28–30.

This shell could be easily taken for a *Rhynchonella*, if one had not the presence of its spires for guidance. It is usually oval, a little longer than broad. The valves are almost equally arched. Their surface is ornamented with twenty-one to twenty-nine small folds or radiating ribs, rather angular, of these the two or four median ones of the dorsal valve are a little thinner and less elevated than the others; the ventral valve is provided with a large sinus, the bottom of which contains one or three ribs thinner than the others. The entire surface is traversed by equidistant concentric lines of growth, and is covered, when the specimen is in a good state of preservation, by very small spines. The specimens entrusted to me agree exactly with the description and figures given by Mr. T. Davidson. One of them has its spires preserved; it is identical with Figure 27A.

Horizon and Localities.—This species is rare in the Wenlock limestone of Dudley, but fairly abundant in that of Rock Farm, Longhope. It is fairly common in a brownish-grey limestone at Yarralumla.

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[1] See Davidson, Mon., p. 107 [137].

Genus—SPIRIFER, *Sowerby.*

SPIRIFER CRISPUS, *Hisinger.*

Terebratula crispa, Hisinger, 1826, Vet. Akad. Handl. pl. 7, fig. 4 (non *Anomia crispa* Linn.)

Spirifer crispus, Von Buch, 1837, Ueber Delthyris, p. 40.

Spirifera crispa, Davidson, 1871, Mon. Brit. Sil. Brach., p. 97, pl. 10, fig. 13–15.

This little species is the only one of the genus whose presence I have been able to prove in the Silurian of Australia. It is easily recognised by the presence of three, five, or seven thick folds on the dorsal valve, of which the median, a little larger than the others, forms the fold. The ventral valve, a little more arched than the other, has one or three folds on each side of the sinus. Usually the surface is traversed by concentric lines or small furrows which are almost entirely wanting in the Australian specimens I have before me.

Horizon and Localities.—Mr. Davidson states that this species is very common in the Upper Silurian, and in England is found in the Llandovery. This is exactly the position it occupies at Dangelong, Australia, where numerous impressions of it occur in an ochreous or olive-coloured shale, more or less hard, in which it is associated with several other species characteristic of the same formation; it has also been collected at Rock Flat Creek, to the east of Monaro.

Genus—MERISTELLA, *Hall.*

MERISTELLA TUMIDA (?), *Dalman.*

Terebratula obtusa, Sowerby, 1815, Trans. Linn. Soc. London, XII, p. 516, pl. 27, fig. 3–4.

Atrypa tumida, Dalman, 1828, Vet. Akad. Handl., p. 134, pl. 5, fig. 3.

Merista ,, Schmidt, 1858, Archiv. Natur. Liv.-Esth. und Kurlands, II, p. 209.

Meristella ,, J. Hall, 1860, Ann. Rept. Regents State Cabinet N. York, XIII, p. 73.

,, ,, Davidson, 1866, Mon. Brit. Sil. Brach., p. 109, pl. 11, fig. 1–13.

Although I have examined but one rather incomplete specimen of the Brachiopod I refer to this species, I have little doubt as to its identity. This specimen has exactly the shape Mr. T. Davidson represents in Plate xi, Figure 4, of his Monograph of Silurian Brachiopoda; the surface is almost smooth, and the front very elevated, otherwise the species is so well-known that it is unnecessary to say more about its characteristics.

Horizon and Localities.—This is one of the most common species in the Upper Silurian of England and Sweden. In Australia it has been collected in a shaley limestone at Slaughta [Slaughter] House Creek, Delegate River.

Division—**MOLLUSCA.**

Class—**LAMELLIBRANCHIATA.**

Genus—PTERINEA, *Goldfuss.*

1. PTERINEA AMPLIATA, *J. Phillips.*

Avicula ampliata, J. Phillips, 1858, Mem. Geol. Survey Gt. Britain, I, Part i, p. 367, pl. 23, fig. 1.

The shape of the shell is obliquely suboval, the posterior end a little prolonged and slightly sloped; the lower margin is subsemicircular, and forms a fairly regular curve that extends from the extremity of the posterior side to the anterior ear. The two valves were close to one another, and very thin; the impression of the right valve, the only one known to me, shows traces of very fine growth lines, which are the only ornaments with which the surface was furnished. The scar of the adductor muscle is very eccentric, moderately large, rounded, and situated on the posterior prolongation of the shell about one centimetre from the margin.

Relations and Differences.—In the ornamentation of the surface it approaches *P. retroflexa*, Wahl., but differs from it in the elongated shape and thinness of the shell.

Dimensions.—Length, four and a half centimetres; breadth, about five centimetres.

Horizon and Localities.—The impression of this species being associated with *Cromus bohemicus*, Barrande, and *Atrypa ? hemispherica*, Sowerby, it must necessarily come from Silurian beds of the same age as the Llandovery. It has been found at Dangelong, in the Cooma District. J. Phillips collected it in a purple lamellar sandstone of Upper Silurian age at Trichrug Hill, Llangadog.

2. PTERINEA PUMILA, *L. G. de Koninck.*

Pl. I, fig. 4.

This little shell, which seems to be subequivalve, is obliquely suboval, a little gibbous, longer than broad; the posterior side is feebly sinuated, and forms a very obtuse angle with the cardinal margin. The anterior side is almost straight; the anterior ear small, a little lobed; the posterior flattened and fairly large. The outer surface is covered with well marked concentric growth lines, somewhat unequal; they are sometimes broken up by small slightly elongated inflations, longitudinal in direction.

Dimensions.—Length, ten millimetres; width, seven to eight millimetres.

Relations and Differences.—The general shape of this shell resembles that of *Pterinea sublævis,* McCoy; but as well as being smaller, it is more elongate and much more strongly striated than this species.

Horizon and Locality.—Though the specimen I have before me contains a large number of individuals, almost all are represented by the right valve. They are contained in a very compact olive-coloured calcareous shale (mudstone) from Yarralumla. As they are associated with *Atrypa ? hemispherica,* it is evident that they come from the same geological horizon as the preceding species.

Class—**GASTEROPODA.**

Order—**PROSOPRANCHIATA.**

Genus—EUOMPHALUS, *Sowerby.*

1. EUOMPHALUS SOLARIOÏDES, *L. G. de Koninck.*

Pl. I, fig. 5.

Shell discoid, spire slightly depressed below the level of the last whorl. The whorls of the spire are five or six in number, enveloping very slightly and turning almost in the same plane; the section is transversly suboval, slightly angular towards the external margin. The suture is well marked by a spiral furrow; the surface is quite smooth on the side of the umbilicus, which is very large and shallow; on the other surface it is ornamented with a large number of transverse tubercles, little noticeable on the last whorl of the spire, but very distinct on the others, and especially so on the second.

Dimensions.—Diameter, eighteen millimetres; height, about three millimetres.

Relations and Differences.—This species has a great resemblance to *E. corndensis,* Sowerby, from which it is distinguished by its greater size and larger number of tuberculations.

Horizon and Locality.—The unique specimen which has been sent to me was found in a fairly compact argillaceous rock of an ochreous tint, collected at Rock Flat Creek, on the eastern side of Maneero.

2. EUOMPHALUS ? PLEUROPHORUS, *L. G. de Koninck.*

Pl. I, fig. 6.

Shell helicoid in shape, rather globular, composed of four or five spiral whorls; spire depressed to a very obtuse angle; sutures fairly well marked by a shallow furrow; whorls clasping, mouth subcircular and relatively small in consequence of the comparative thickness of the shell, principally on the side of the suture; on the opposite side the test is flattened, and extends in a pretty well marked margin around the base of the shell. This part being almost entirely enclosed in a very hard siliceous matrix, from which it was almost impossible to develop it, I have been unable to determine exactly the shape of the umbilicus. However, an accidental fracture enables me to say that it was not large, and was funnel-shaped. The external surface is rough, but it is probable that this roughness is due to fossilisation, as there is no regularity about it.

Dimensions.—Length, twenty-three millimetres; transverse diameter, thirty-five; spiral angle, 148°; height of the last whorl of the spire, twenty millimetres; diameter of the opening of the mouth, six millimetres.

Relations and Differences.—This species differs from all known to me in the thickness of the test, which almost from its form recalls to one the tube of *Magilus.* I have also some doubts about its generic position, but it has been impossible for me to develop the only specimen sent to me sufficiently to remove my uncertainty.

Horizon and Locality.—I have no positive evidence as to the age of this species. The quartzose rock which contains it, the characters of which are similar to some of the rocks in which were found the majority of the

Cœlenterata I have already described, is the only fact that makes me think that it is of the same age as these, and that it represents Upper Silurian deposits. The specimen was found on the banks of the Murrumbidgee, near Yass.

Genus—EUOMPHALUS, *Sowerby.*

Sub-genus—OMPHALOTROCHUS, Meek.

Euomphalus (Omphalotrochus) Clarkei, *L. G. de Koninck.*

Pl. I, fig. 7.

Shell trochiform, imperforate, composed of five or six spiral whorls enveloping one another for about half their length, base depressed, slightly concave in the middle; the last whorl is greatly developed, and comprises more than three-quarters of the entire length of the shell; the lower margin is angulated; the portion between the edge and the suture is slightly convex; the spire is very short and the apex obtuse; the test is very thick. The surface, as well as having several varices of irregular shape and distribution, is ornamented by a large number of lamellæ, imbricating from before backwards, of which the edge parallel to that of the peristomé has a sigmoidal shape on the dorsal portion of the last whorl and curves towards the base, or all converge towards the end of the columella; in any case, at a short distance from the angle that bounds the base the lamellæ form a slight puckering along a very narrow band, and so form a faintly-marked concentric keel which proves the presence of a canal or posterior siphon. This condition, together with the sigmoidal outline of the lip, reminds one very much of the apertures of *Euomphalus discors* and *rugosus*, Sowerby, from the Silurian of Dudley, so that, in spite of the want of an umbilicus, their resemblance does not strike one at once, and is not easy to see that all belong to the same group. According to Bayan, of the École des Mines, Paris, who, a short time before his death, gave me some information on this subject, this group, in which he also placed some other species, could be placed under the genus *Omphalotrochus*, proposed by Mr. Meek for an analogous Carboniferous species from California.* Although the peristome is angular, the transverse section of the whorls proves that the mouth is in reality circular; the internal or columellar border is covered by a thin somewhat extended callosity. I know no species that can be compared to this one.

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* Geological Survey of California, Palæontology, i, p. 15.

Dimensions.—The specimen described in all probability was not found *in situ*; the test is silicified, and several small pieces of white limestone adhere to it; the interior of the mouth is covered with crystals of calcite. It comes from the Yass District.

Genus—BELLEROPHON, *Montfort.*

BELLEROPHON JUKESII, *L. G. de Koninck.*

Pl. IV, Fig. 2.

Shell of medium size, subdiscoid, faintly umbilicate; whorls of the spire increasing rapidly in size, and ending in a mouth that is higher than broad; there is a well-marked carina on the back, produced by the band of the sinus. Surface ornament with faintly-marked lines of growth almost invisible to the naked eye.

Dimensions.—Diameter, thirty; width of the last whorl, fifteen; height of the same, eleven millimetres.

Relations and Differences.—In profile this species has some resemblance to *B. Wenlockensis*, Sowerby, in which the whorls envelope one another to the same extent, and the carina is similar, but while the English species is globose the Australian is subdiscoidal, and is relatively larger.

Horizon and Locality.—One slightly distorted specimen was found in a soft yellowish-brown argillaceous rock at Rock Flat Creek. This rock is similar to the matrix of the Silurian Trilobites from the same place. I have dedicated this species to J. B. Jukes, who has been removed too soon from Science and the high estimation of his many friends.

Class—PTEROPODA.

Section—THECOSOMATA.

Genus—CONULARIA, *Miller*.

CONULARIA SOWERBYI (?), *Defrance*.

Conularia Sowerbyi, Defrance, 1828, De Blainville, Man. Malac., p. 377, pl. 14, fig. 2.

„ *quadrisulcata*, J. de C. Sowerby, 1839, in Murchison's Silurian System, p. 626, pl. 12, fig. 12.

„ *Sowerbyi*, De Verneuil, 1845, Russia and Ural Mts., II, p. 348, pl. 24, fig. 5.

„ „ Salter, 1859, in Murchison's Siluria, p. 550, pl. 25, fig. 10.

As I have but a small piece of the shell now before us, it is impossible to say positively that it belongs to this species. I have, however, some reason for believing it so from the two reasons that, on the one hand, the ornamentation is very similar to that figured by Sowerby, and, on the other, that the specimen was collected from the rock that contains *Encrinurus Barrandei*, L. G. de Koninck, *Atrypa hemisphærica*, Sowerby, *Retzia Salteri*, Davidson, all species which in England are found with *Conularia Sowerbyi*, which in its turn might very fitly be associated with the same species in Australia.

Horizon and Localities.—As the result of previous observations, the specimen of *Conularia* found at Rock Flat Creek is found in Silurian beds of the same age as the Upper Llandovery; E. de Verneuil has collected *Conularia Sowerbyi* at Chotim, in Bessarabia, on the banks of the Dneister.

Class—CEPHALOPODA.

Order—TETRABRANCHIATA.

Genus—ORTHOCERAS, *Breyn*.

ORTHOCERAS IBEX, *J. de C. Sowerby*.

Orthoceras ibex, J. de C. Sowerby, 1839, in Murchison's Silurian System, p. 613, pl. 5, fig. 30 (*non* Phillips).

„ *articulatum*, *Idem*, *Ibid.*, p. 613, pl. 5, fig. 31.

„ *ibex*, Salter, 1859, in Murchison's Siluria, p. 551, pl. 29, fig. 3–4.

Shell very long, diameter increasing slightly during its growth; transverse section elliptic. Septa oblique, fairly numerous; to each septum corresponds one of the ridges or slightly angular annulations with which the outer surface is provided. The surface appears to have been smooth and the shell very thin. The siphuncle, its position, as well as the shape of the last septum or body chamber, are quite unknown to me.

Dimensions.—The apical angle being only 4° to 5°, this species must have been more than fifteen centimetres long, supposing that the growth was regular. In a specimen a centimetre in diameter the height of each chamber is about two millimetres.

Horizon and Localities.—In England this species occurs in the Upper Silurian of the Ludlow District. In Australia it is associated with the preceding species.

Class—CRUSTACEA.

Order—OSTRACODA.

Genus—ENTOMIS, *Rupert Jones.*

ENTOMIS PELAGICA, *Barrande.*

Entomis pelagica, J. Barrande, 1872, Syst. Sil. Bohême, I, Suppl., p. 515, pl. 24, fig. 1–6.

In form the valves are subsemicircular; this is caused by the curve that bounds the two ends of the hinge line, which is straight or slightly sinuous for the rest of its length.

Each of the two valves is divided into almost equal parts by a fairly deep and slightly sigmoidal furrow, which, springing from the hinge line, ends at a little distance from the opposite border. Both these portions are arched, but the convexity of the lower portion is more regular than that of the cephalic, which is distinguished by a well-marked tubercle on the margin and almost opposite the middle of the transverse furrow. The remain of the surface of this portion is faintly undulated. The two valves are quite smooth; the test seems to have been very thin.

Dimensions.—The sole specimen observed is only three millimetres long by about two broad. Although these dimensions are a little different from those given by Barrande (six millimetres by about three), I have not thought it advisable to separate the Australian from the Bohemian species, as all the other characters agree with great exactitude, particularly the well-marked cephalic tubercle, which serves to distinguish it from its congeners.

Horizon and Locality.—All the Bohemian species come from the Silurian limestone of Konieprus. I have seen it in a piece of olive-coloured argillaceous rock from Yarralumla, in which it is associated with numerous fragments of Trilobites and a branch of *Alveolites repens*, Fougt.

Order—TRILOBITA.

Genus—ILLÆNUS, *Dalman.*

ILLÆNUS WAHLENBERGI ? *J. Barrande.*

Illænus Wahlenbergi, J. Barrande, 1846, Nouv. Trilob., p. 13.

„ *subtriangularis*, Hawle and Corda, 1847, Prodr. einer Mon. Böhm. Trilob., pl. 3, fig. 29.

„ *Wahlenbergianus*, J. Barrande, 1852, Syst. Sil. Bohême, I, p. 684, pl. 34, fig. 19–24.

It is not without doubt that I refer the single pygidium of an *Illænus* sent to me to the species that Barrande has dedicated to Wahlenberg. This doubt can be removed only by the discovery of complete specimens; nevertheless, even if the species be different, it will be closely allied to it [*Wahlenbergi*] from the fact that the characters as given by Barrande agree perfectly with those of the specimen I have. In detail, this pygidium, which is only three millimetres long by two broad, has practically the outline of an equilateral triangle with strongly-rounded angles, and for which the end of the thorax serves as a base. It is fairly regularly arched, and the surface is quite smooth. Four segments of the thorax remain connected to it.

Horizon and Locality.—It occurs in a white crystalline limestone, veined with red, at Boree Cave.

Genus—STAUROCEPHALUS, *J. Barrande.*

STAUROCEPHALUS CLARKEI, *L. G. de Koninck.*

Pl. I, fig. 8.[1]

Although I am acquainted with the impression of the head and pygidium of this species only, the form and characters are sufficient to convince me that it differs from all its congeners at present known.

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[1] Pl. I, figs. 13, 13a.—W.S.D.]

The glabella is prominent and almost spherical in the anterior portion, while the posterior is much less elevated and narrow, and seems to have acted as a peduncle; it is bounded by deep but rather narrow dorsal furrows; this peduncular portion, which is separated from the spherical part by a single transverse furrow, situated immediately behind this part, has two lateral furrows which do not reach the centre.

The fixed cheek is slightly arched and folded transversely. The eye is small and projecting; the free cheek is very small, but the state of preservation will not admit of my giving either its shape or boundary.

The outline of the head is semi-oval, and bounded by a rather narrow ridge situated in front of the glabella, which completely hides it. This ridge is prolonged posteriorly into genal spines, fairly acute, although thick, and provided on the upper surface with two vertical spines, the more prominent of which is near the genal angle, and the other is much smaller and almost immediately below the first mentioned.

The thorax is unknown to me.

The pygidium is very remarkable; the axis is elongated, narrow, and made up of seven segments. The surface of the lateral lobes is slightly convex. The segment of the axis gives rise to a rib which is prolonged to a considerable length, slightly curved, and its base makes almost a right angle with the dorsal furrow of the axis; immediately below this prolongation another a little longer is developed with a more oblique direction, and which forms an acute angle with the first. By this arrangement the pygidium approaches that of some species of *Cheirurus* and *Acidaspis*. As its surface is quite smooth it is probable that that of other portions of the animal will be so also.

Relations and Differences.—In the form of the glabella and in general characters this species has considerable resemblance to *Staurocephalus unicus*, W. Thomson, but differs from it in the folding of the cheeks, and the form of the pygidium. In this latter point it approaches somewhat *Staurocephalus globiceps*, Portlock. It cannot, however, be confused with this species, as the pygidium is provided with two spines only, instead of four.

Horizon and Locality.—Mr. Clarke found this species at Rock Flat Creek in an argillaceous rock, yellowish-ochre in colour, rather friable in some parts, harder and schistose in others. It is associated with *Cromus bohemicus* and several other Crustacea. I allow myself the great pleasure of dedicating this species to the indefatigable pioneer of civilisation and science to whom I owe its knowledge.

Genus—CHEIRURUS, *Beyrich.*[1]

CHEIRURUS INSIGNIS, *Beyrich.*

Cheirurus	*insignis,*	Beyrich, 1845, Ueber Böhm. Trilob., p. 12, fig. 1.
,,	,,	Barrande, 1846, Not. Prélim. sur les Trilob., p. 49.
Chirurus	,,	Hawle and Corda, 1847, Prodr. einer Mon. Böhm. Trilob., p. 133, pl. 6, fig. 7.
Ceraurus	,,	J. Hall, 1851, Pal. N. York, II, pp. 300, 306, pl. 66, fig. 4, and 67, fig. 9 and 10.
Cheirurus	,,	J. Barrande, 1852, Syst. Sil. Bohême, I, p. 782, pl. 41, fig. 1–13.

A solitary pygidium of this important species was found among the numerous fragments of Trilobites collected by the Rev. W. B. Clarke. It is so similar to the specimen figured by Barrande in his wonderful work, "Système Silurien du Centre de la Bohême," vol. I, plate xlv., fig. 8, that it is impossible to be mistaken in its determination. This species is distinguished from most of its congeners by the form of the pygidium and pleuræ, which are four in number, the last pair of which are represented by a pointed rudimentary one, which follows the direction of the axis. This last character is particularly well-developed in the Australian specimen.

Horizon and Localities.—According to Barrande this species is one of a small number of Trilobites which are found in the two divisions of the Bohemian Silurian.

In Australia it is found at Yarralumla in a brownish argillaceous rock, somewhat compact, and which can be scratched by the nail, associated with *Strophomenes pecten,* Linnæus and *Cromus bohemicus,* Barrande, species that help to fix the age to which they belong.

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[1] [Vide Jenkins (J.) Procs. Linn. Soc. N. S. Wales, 1879, iii, Pt. 1, p. 30, pl. 6, figs. 5, 6, 7; *op. cit.,* Pt. 3, p. 217, pl. 6, fig. 8, pl. 17, fig. 7.—W.S.D.]

Genus—ENCRINURUS, *Emmrich.*

ENCRINURUS PUNCTATUS, *Brunnich.*[1]

Entomolithes paradoxus, Linnæus, 1759, Acta Acad. Sc. Holm., p. 22, pl. 1, fig. 2.

Trilobites punctatus, Brunnich, 1784, Nye Samling K. Norske Vidensk. Selskabs Schrifter, I, p. 394.

Entomostracites punctatus, Wahlenberg, 1821, Acta Soc. Sc. Ups., III, p. 32, pl. 2, fig. 1.

Calymene variolaris, Al. Brongniart, 1822, Crust. Foss., p. 14, pl. 1, f. 3A (fig. 3B *excepta*).

„ *punctata,* Murchison, 1839, Silurian System, pl. 23, fig. 8.

Phacops variolaris, Emmrich, 1839, De Trilobitis, p. 20.

Encrinurus punctatus, *Idem,* 1845, Neues Jahrb. für Min., &c., p. 20.

„ „ Corda and Hawle, 1847, Prodr. einer Mon. Böhm. Trilob., p. 91, pl. 5, fig. 5.

„ „ Kutorga, 1847, Verhand. K. Min. Russ. Gesells. St. Petersburgh, p. 299, pl. 8, fig. 4.

Cybele punctata, Fletcher, 1850, Quart. Journ. Geol. Soc., VI, p. 403, pl. 32, fig. 1–5.

Encrinurus „ Salter, 1853, Mem. Geol. Survey United Kingdom, Dec. vii, p. 6, pl. 4, fig. 14–16.

„ „ Salter, 1859, in Murchison's Siluria, p. 100, fig. 10, and p. 261, fig. 5, pl. 10, fig. 15.

This species has been so well described and illustrated by both Fletcher and Salter that I feel I need not enter into a detailed description of the distinguishing characters, the principal and most easily remembered of which is the longitudinal arrangement of five or six small tubercles which ornament the median region of the axis of the pygidium. The glabella is but feebly inflated, thick and ornamented with tubercles, of which the anterior are a little larger than the others, and are arranged in an arc on the edge of the limb. The glabella-furrows are faintly marked, and from the arrangement of the tubercules it is hard to define their presence. The genal spines are pointed, but not very long. The eye is small and supported on a projecting tubercle, the sides of which bear several delicate radiating folds trending towards a similar number of small tubercles arranged around the base, while the inner portions situated above the facial suture are covered with large tubercles.

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[1] [Vide R. Etheridge, Junr., Journ. R. Soc. N. S. Wales for 1880 [1881], xiv, p. 249, pl., figs. 11, 12.—W.S.D.]

The thorax is made up of eleven segments; the axis is convex and clearly separated from the pleuræ by well-marked furrows; each of the two ends of its rings has a projecting tubercle; the pleuræ are granulose and rather strongly curved upon themselves at about half their length. The pygidium is sub-triangular, often ending in a more or less long process; the axis is made up of from twenty-three to thirty segments, the medium portion of which is usually defaced, and thus forms a smooth longitudinal band on which are placed five or six small projecting pointed tubercles. The lateral lobes are divided into a number of ribs, varying in different specimens from eight to ten, separated from one another by well-marked furrows; the direction of these ribs is more inclined to the axis as they approach towards the posterior extremity of the animal.

Horizon and Localities.—In England and Sweden this species is characteristic of the Upper Silurian, and is found in the Llandovery and in the Wenlock limestone, as well as in the limestone of Gothland. I am not certain that the specimens of *Encrinurus* occurring in great abundance in the Lower Silurian of the Galway District in Ireland, which have a great resemblance to this species, and which M'Coy described as *Encrinurus Stokesi*[1] are really identical with it, as Salter thinks.

Among the numerous specimens collected in Australia, only two belong to *Encrinurus punctatus*. One, the pygidium of which only is preserved, comes from the Yass District, and occurs in a quartzose rock, coloured red by oxide of iron; it is associated with *Pentamerus oblongus*, Sowerby, and *Cyathophyllum articulatum*, Wahlenberg, the presence of which proves the geological horizon; the other, almost complete, and wanting only a small part of the head, has been found at Duntroon in a slightly yellow and little friable schistose argillaceous rock.

2. ENCRINURUS BARRANDEI, *L. G. de Koninck.*

Pl. I, fig. 8.

Though I know only the head and pygidium of this species, these two parts are sufficiently characteristic to enable me to readily separate it from *E. punctatus* and *variolaris*, the two species which are most like it.

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[1] It must be noted that M'Coy abandons these names in his "British Palæozoic Fossils," p. 158, while holding that the species differs from that described by Fletcher and Salter under the name of *E. punctatus*, and that it is the same as that described by Wahlenberg. I am of opinion that the contrary is the case.

The shape of the head of *E. Barrandei* has much agreement with that of *E. punctatus*; it is however, a little broader, the glabella is much less convex, the axal furrow is faintly marked; I have not succeeded in determining the presence of glabella furrows. The genal spines are almost altogether wanting. The tubercles, with which nearly all the surface is covered, resemble much, both in form and general arrangement, those of *E. punctatus*, but appear to me to be less numerous on the fixed cheeks. The eye is small, flat, and little raised above the surrounding surface, it is facetted. Opposite the centre of the palpebral lobe, and a very little distance from it, may be seen a tubercle, which is a little larger than those surrounding it.

The pygidium is sub-triangular and a little broader than long, while the opposite obtains in *E. punctatus*. The angle formed by the sides at the extremity instead of being acute as in the last-mentioned species is obtuse and nearly a right angle. The axis is made up of twenty-five or twenty-six segments distinct throughout and non-tuberculate; the lateral lobes are much wider than the median, and are made up of nine arched ribs, more or less inclined according to the position they occupy. These ribs are quite smooth, and are separated from one another by a shallow furrow; the posterior extremity of the pygidium shows no sign of a spine.

Dimensions.—Length of the head, thirteen millimetres; breadth, twenty-eight millimetres; distance between the eyes, eleven millimetres; length of the pygidium, thirteen millimetres; width of the first segment of the axis, five millimetres; width of the first rib, 7·5 millimetres; angle of the posterior extremity, about 100°.

Relations and Differences.—As I have already observed above, this species occupies a position midway between *E. punctatus* and *variolaris*. As I have already laid stress on the characters which distinguish it from the first-named, I will now confine myself to those which separate it from the second, as well as from *E. sexcostatus*, Salter, and *multisegmentatus*, Portlock. I have remarked that the head, and particularly the glabella of *E. variolaris*, are more inflated and more convex, and that its eyes are more prominent; and, moreover, the axis of the pygidium is composed of ten segments, according to Fletcher, and of from nine to twelve, according to Salter. The small number of pygidial ribs in *E. sexcostatus*, coupled with the convexity of its glabella, serves to obviate confusion with *E. Barrandei*. As to *E. multisegmentatus*, it differs from it in the more triangular and narrower form of the head, and in the greater number of segments of the axis and ribs in the pygidium.

Horizon and Localities.—Several specimens have been found at Yarralumla in a grey argillaceous limestone, which most probably corresponds to the Wenlock Limestone. They are there associated with *Calymene Blumenbachii,* Al. Brong.

Genus—CROMUS, *Barrande.*

1. Cromus bohemicus (?) *J. Barrande.*

Cromus bohemicus, Barrande, Syst. Sil. Bohême, 1852, I, p. 828, pl. 43, fig. 15–17.

The head is sub-semicircular. The glabella is elongate, slightly arched, and is widest a little behind the anterior end; on either side there are four narrow glabella furrows, straight and nearly equally arranged between the base and the point of greatest width; it has a great number of granulations, some of which are larger than the others. The fixed cheek is separated from the glabella by a well-marked furrow; it is sub-triangular, and occupies the entire width of the corresponding thoracic lobe. The genal angle is rounded.

I have not had the opportunity of examining either the eye or the thorax.

The pygidium, sub-triangular in form, is a little broader than long, and is strongly arched transversely. The axis is made up of twenty-five to thirty segments, and is only about half the width of each of the lateral lobes, above which it scarcely projects; some of the anterior rings are well marked throughout, while the majority of the others are discontinuous towards the middle of the axis, and on this portion are ornamented with several small granulations. Each of the lateral lobes is made up of eleven or twelve ribs, the direction of which approximates to that of the axis in proportion as their point of origin is further from the thorax; they are a little broader on the edges of the lobes than on the other side, and terminate in a small angular projection which gives a dentate appearance to the outline of the pygidium.

Observations.—All the characters I have just mentioned are shown on the two specimens I refer to the species described by Barrande, and found by him in Bohemia. Although they may be very similar to those described by the learned French palæontologist, I have some doubt as to the identity of the Australian and Bohemian specimens, because the glabella appears to me to be too inflated. In the last species the furrows that separate the ribs are fairly narrow, while they are shown as being deep and as broad as the ribs in the first-mentioned species. Finally, all the specimens examined having lost their eyes, I have been unable to investigate either the shape or position of those organs.

Horizon and Localities.—According to Barrande, this species is characteristic of the lower calcareous Étage E. of his subdivision of the Upper Silurian, and has been found at Tobolka, Wohroda, &c., associated with *Cromus Beaumonti*, Barrande, *Cheirurus insignis*, Beyrich, and numerous other Trilobites. Under analogous conditions the species has been collected in a grey argillaceous limestone at Yarralumla.

2. CROMUS MURCHISONI, *L. G. de Koninck.*

Pl. I, fig. 9.

This species, the head of which appears to me to have a sub-semicircular outline, is singular in the shape of the glabella, which is almost the only well-preserved part of the specimen submitted to me. The glabella is club-shaped, the anterior or frontal portion is about twice as wide as the posterior; the anterior portion is depressed while the posterior is sub-semicylindrical; this portion has four unbroken furrows forming ridges, each with five tubercles. The surface of the anterior portion is also ornamented with a large number of similar tubercles. The glabella is clearly separated from the fixed cheeks by curved very deep longitudinal furrows. The fixed cheek in convex near the glabella, and is of the same width. The eye is projecting, and is surrounded on the side of the palpebral lobe by a semicircular groove. The free cheek and the genal angle are unknown to me; the same applies to the thorax and pygidium.

Relations and Differences.—*Cromus Murchisoni* is distinguished from all known congeners by the shape of the glabella and the depth of the furrows which separate it from the fixed cheeks.

Horizon and Localities.—A very imperfect specimen, associated with the preceding, has been found at Yarralumla, and another which has served as the subject of my description has been collected at Quedong in a greyish argillaceous limestone.

Genus—CALYMENE, *Al. Brongniart.*

Calymene Blumenbachii, *Al. Brongniart.*

Entomolithus paradoxus, Parkinson, 1811, Organic Remains, III, pl. 17, figs. 11, 13, and 14.
Calymene Blumenbachii, Al. Brongniart, 1822, Crust. Foss., p. 11, pl. 1, fig. 1.
„ „ Dalman, 1826, Om Palæoderna, p. 35, pl. 1, figs. 2–3.
„ „ Murchison, 1839, Silurian System, p. 653, pl. 7, figs. 6–7 (fig. 5 *exclusa*).
„ *niagarensis,* J. Hall, 1843, Geol. Rept. 4th Distr., p. 101, fig. 3.
„ *Blumenbachii,* McCoy, 1851, Brit. Pal. Foss., p. 165.
„ *subdiademata, Idem, id., ibid,* p. 166, pl. 1 F, fig. 9 (fig. 10 *exclusa*).
„ *spectabilis,* Angelin, 1842, Pal. Suecica, pl. 19, fig. 1.
„ *Blumenbachii,* J. Barrande, 1852, Syst. Sil. Bohême, I, p. 566, pl. 19, fig. 10.
„ „ Salter, 1866, Mon. Brit. Trilob., p. 93, pl. 8, fig. 7–16, and pl. 9, fig. 1–2.

There cannot be the least doubt as to the determination of the specimens I have before me, which comprise a head and two pygidia. To convince oneself it is sufficient to compare them with Salter's excellent figures and with the specimens from Dudley, which are widespread in collections and very well known.

Horizon and Localities.—According to Salter this species came into existence prior to the deposition of the Lower Silurian Beds of the Caradoc and did not disappear till the upper beds of the Wenlock, in which it is found abundantly at Dudley and in Gothland. It is rarer in Bohemia and in the United States, where it is found in the Niagara Group. In Australia, it occurs in the grey-green argillaceous limestone of Yarralumla, associated with the other species of Crustacea I have already mentioned.

Genus—PROETUS, *Steininger.*[1]

Proetus Stokesii (?) *Murchison.*

Asaphus Stokesii, Murchison, 1839, Silurian System, pl. 14, fig. 6.
Proetus „ Lovèn, 1843, Svenska Trilobiter, pl. 1, fig. 3.
Forbesia „ McCoy, 1851, Brit. Pal. Foss., p. 174.
Proetus „ Salter, 1859, in Murchison's Siluria, p. 540, pl. 17, fig. 7.

I refer to this species three small pygidia whose characters agree perfectly with those given by McCoy and with the outline of the figure of it published by Murchison. Unfortunately I have not had the opportunity of comparing specimens themselves. It will be necessary to await the discovery of complete specimens before definitely assigning it to a species.

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[1] [For a description of the Australian Silurian Proetidæ see Etheridge (R., Junr.) and Mitchell (J.) "The Silurian Trilobites of New South Wales, with References to those of other parts of Australia—Part I." Procs. Linn. Soc. N. S. Wales, 1892, VI (2), Pt. 3, pp. 311–320, pl. 25; *Ibid.*, Part II, *op. cit.*, 1894, VIII (2), Pt. 2, p. 169.—W.S.D.]

These pygidia are subsemi-elliptical in shape, and surrounded by a comparatively wide limb. The axis is only half the width of the lateral lobes, and is made up of six or seven rather faintly-marked rings; the ribs are obtuse and faintly visible; those which can be seen have a sutural furrow.

Horizon and Localities.—First recorded by Murchison in the Wenlock limestone at Dudley, this species has been found by Loven in limestone of the same age in Gothland. It has been found in Australia at Yarralumla.

Genus—LICHAS, *Dalman.*

Among the Trilobites that Mr. Clarke submitted to me for examination only a single specimen of Lichas has been found, but it is so incomplete and badly preserved that it has been impossible for me to determine the species. It is fairly large, and in the irregular mode of granulation approaches *Lichas palmata,* Barrande.[1] It occurs in a partly schistose argillaceous rock at Rock Flat Creek.

Genus—BRONTEUS, *Goldfuss.*

1. Bronteus Partschi, *J. Barrande.*[2]

Bronteus Partschi, J. Barrande, 1846, Not. Prelim. sur les Trilob., p. 60.
,, ,, Hawle and Corda, 1846, Prodr. einer Mon. Böhm. Trilob., p. 58.
,, *subtriangularis, Idem, id., ibid,* p. 57.
,, *carinatus, Idem, id., ibid,* p. 59.
,, *Partschi,* J. Barrande, 1852, Syst. Sil. Bohême, I, p. 870, pl. 46, fig. 19–31.

I am acquainted with the pygidium of this species only, but it agrees so completely with the figures and descriptions given by Barrande that I have no doubt as to its identity with the Bohemian species. The shape is semi-oval, the surface, slightly and uniformly arched in the median region, flattens towards the edge without becoming concave in every case. Barrande observes that the line of articulation is straight throughout almost all its extent and does not become curved till near the ends. The rudiment of the axis, very prominent, forms a triangle, the height of which is almost equal to the base. The middle rib is twice the size of the adjoining ones, and dilates gradually towards the margin without bifurcating. The rib which adjoins the thorax becomes a little larger than the others towards the end. The six intermediate ribs are similar to one another, and are separated by narrow furrows which near the edge are not a third the width of them.

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[1] [*Vide* Ratte (F.)—Procs. Linn. Soc. N. S. Wales, 1886, I (2), p. 1065, pl. 15, fig. 16; *op. cit.*, 1887, II (2), p. 95, pl. 1, fig. 6.—W.S.D.]

[2] [Messrs. R. Etheridge, Junr., and J. Mitchell have described the Australian Species as ***Bronteus Jenkinsi***, Procs. Linn. Soc. N. S. Wales, 1890, V (2), Pt. 3, pp. 501–504, pl. 18. See also JENKINS (J.) *Bronteus Partschi*, *op. cit.*, 1879, III, Pt. 3, pp. 217–221, pl. 17, figs. 3–6.—W.S.D.]

According to Barrande the doublure of the test only extends over two-fifths of the distance between the edge and the rudiment of the axis. I have been able to satisfy myself that in the Australian specimen it extends right to the rudiment of the axis. This is the only difference I have been able to determine.

Dimensions.—Length of pygidium, seven; breadth, ten millimetres.

Horizon and Localities.—In Bohemia this species is characteristic of the limestone called E. by Barrande, which forms the base of the Upper Silurian beds; it is found near Beraun and in several other localities. Mr. Clarke has collected it at Boree Cavern in a mottled limestone of white, grey, and red.

2. BRONTEUS GONIOPELTIS, *L. G. de Koninck.*

Pl. I, fig. 10.

The shape of the pygidium in this species is rather peculiar, so that it is easy to distinguish it from those of all its congeners at present known. The outline is parabolic and broader than long, the median portion of the line of articulation with the thorax forms almost the third of its extent, and is straight, while the lateral portions are strongly curved. The rudimentary lobe of the axis is hemispherical; the rest of the surface is very slightly arched over the greater portion and concave towards the margin; it appears to be granulated. The ribs are separated from one another by a narrow shallow groove; the median rib is twice the width of the three neighbouring ones and of that which borders the thorax, and almost three times the size of the three ribs between these and the first three. The limb is narrow, and has a series of rather sharp projections joined to one another by regular curves. These points correspond to each of the ribs, but with the exception of the median projection they are arranged a little behind a line that would pass through the middle of the ribs.

Dimensions.—Length of the pygidium, eleven millimetres; breadth, twenty-one millimetres; length of the rudimentary axis, three millimetres; breadth, five millimetres; width of the median lobe towards the margin, four millimetres; length of the projections, one to one and a half millimetres.

Relations and Differences.—I know but two Silurian species of *Bronteus* in which the pygidium is surrounded by projections, viz.—*B. thysanopeltis* and *B. clementinus*, Barrande. It differs from the first in the number of projections, and from the second in the shape and small length of these, and from both in its median rib, which is simple, while in its congeners it is bifurcated.

Horizon and Locality.—Found at Rock Flat Creek in an ochreous, rather compact argillaceous rock.

Genus—HARPES, *Goldfuss.*

HARPES UNGULA, *Sternberg.*

Trilobite sungula, Von Sternberg, 1833, Verhandl. Gesells. Vaterl. Mus. Böhm., p. 52, pl. 2, fig. 1.
Harpes ,, Burmeister, 1843, Organ. Trilob., p. 88.
,, *tenuipunctatus* (?) J. Barrande, 1846, Not. Prélim. sur les Trilob., p. 55.
,, *ungula,* Hawle and Corda, 1847, Prodr. einer Mon. Böhm. Trilob., p. 163, pl. 7, fig. 38.
,, *concavus, Idem, id., ibid.,* p. 163.
,, *sculptus, Idem, id., ibid.,* p. 163.
,, *ungula,* J. Barrande, 1852, Syst. Sil. Bohême, I, p. 317, pl. 8, fig. 2–6, and pl. 9, fig. 1–6.

The characters of the single specimen of *Harpes* that has been submitted to me, consisting of an almost complete head, agree so exactly with the description and figures that Barrande has given of *H. ungula,* Sternberg, that I think I am not wrong in referring it to this species. I will not, therefore, enter into greater detail concerning it, details that will be found thoroughly described in the work of the eminent French palæontologist I have just mentioned. I will only say that the head in question belongs to a young individual, and has a length of only three millimetres.

Horizon and Localities.—In Bohemia this species belongs to the limestone of Barrande's Étage E., and consequently, to the Upper Silurian. It is there found in a large number of localities. In Australia it has been collected at Boree Cave in a mottled limestone, associated with *Bronteus Partschi.*

Appendix to the Silurian Species.

Among the numerous imprints of calices of Rugose Corals that have been submitted to me, I have met with several similar to those known as *Cyathophyllum binum, elongatum,* &c., but of which the specific diagnosis will remain doubtful and incomplete for so long as it is not possible to find specimens on which the exact structure of the corals these imprints belong to can be studied. For this reason I have refrained from referring to them in my work.

However, I make an exception of an impression which has almost the shape of a half-cone, that is to say of a very elliptic cone, which has been cut in half along the axis, and which seems to me to have been formed by the removal of a fossil in all respects like *Calceola.*

In reality the greater part of the curved surface is covered with small radiating ridges, very apparent towards the margin, and beset with small granulations scarcely visible to the naked eye, which have been formed by very small pits at the bottom of the furrows in the calice. The flat face is not ribbed, except towards the lower margin; these ribs are smooth. On the median portion, corresponding to the axis of the cone, is seen a fairly deep longitudinal slit, which has been formed by the median septum, usually more developed than the others in the calice of *Rhizophyllum,* to which I refer it, because true *Calceola* are up to the present unknown in Silurian rocks. I describe it under the name of *Rhizophyllum interpunctatum.*[1]

Horizon and Locality.—The specimen I have just described and illustrated on Pl. I, Fig. 10,[2] was found in an ochreous argillaceous rock at Rock Flat Creek, where several of the species of Trilobites already described occur, so that its Silurian age is undoubted.

It is on a piece of similar rock containing a complete head of *Cromus Murchisoni,* L. G. de Koninck, that I noticed the impression figured on Pl. IV, fig. 1. This impression appeared to me to be worthy of notice, because of its great resemblance to the form frequently met with in some Devonian beds of the United States and described under the name of *Fucoïdes cauda Galli*, Vanuxem, for which, together with some other forms, Herr E. Kayser has recently erected the genus *Spirophyton*.

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[1] [See also Etheridge (R., Junr.)—Journ. R. Soc. N. S. Wales for 1880 [1881], XIV, p. 247; Lindstrom, Bihangk. Vet. Akad. Handl., 1882, VII, No. 4, p. 29; Etheridge (R., Junr.), Records Austr. Mus., 1891, I, No. 10, p. 203, pl. 30, figs. 7–15.—W.S.D.]

[2] [Pl. I, fig. 14.—W.S.D.]

If, in reality, as I believe, this imprint belongs to the genus *Spirophyton*, it is interesting in that it would be the first that has up to the present been noticed in the Silurian.

It will also form a new species, which I propose to call *Spirophyton cauda Phasiani*, and which is distinguished from all the other species by the great number of fine striations on the surface of the laminæ, which are arranged parallel to the strong curved, almost equidistant, ridges with which the surface is covered.

Horizon and Locality.—The only specimen of this *Spirophyton* at present known was collected at Duntroon.

GEOLOGICAL SUMMARY.

Among the fifty-nine species of fossils already described thirty appear to me to be new to science, and eight can only be determined with some uncertainty, owing to the imperfect state of preservation of the specimens submitted to me for examination.

However, it must be noticed that the new species all belong to genera represented in Europe or America by very closely related species, with which I have taken care to compare them, and with reference to which I have discussed the analogy and pointed out the points of difference.

As all the species already known belong to the Upper Silurian, it may be inferred without fear of error that the forms accompanying them came into existence during the same period, and that the Australian Fauna of that time shows no appreciable difference in forms and size to those of the same age in other parts of the World.

It may also be added that in Australia, as elsewhere, the Upper Silurian Epoch has given birth to numerous more or less well-marked beds, of which those at the base are composed mainly of argillaceous rocks, more or less compact and sometimes schistose, corresponding to the Upper Llandovery, the most characteristic fossils of which it contains, while the uppermost bed, representing the Ludlow, is made up of very hard quartzites, usually coloured red by oxide of iron and of white or grey crystalline limestone.

The different species are distributed in the following manner:—

LUDLOW GROUP.

1. Stromatopora striatella, d'Orb.
2. Ptycophyllum patellatum, Schl.
3. Cystiphyllum silurense, Lonsd.
4. Omphyma Murchisoni, M. Edw. and J. H.
5. Cyathophyllum articulatum, Wahl.
6. Halysites escharoïdes, Lamk.
7. Monticulipora pulchella, M. Edw. and J. H.
8. Alveolites repens, Fougt.
9. „ rapa, De Kon.
10. Favosites cristata, Blumenb.
11. „ Forbesi, M. Edw. and J. H.
12. „ aspera, d'Orb.

LLANDOVERY GROUP.

1. Spirophyton (?) cauda Phasiani, De Kon.
2. Rhizophyllum (?) interpunctatum, De Kon.
3. Strombodes diffluens, M. Edw. and J. H.
4. Striatopora australica, De Kon.
5. Aulopora fasciculata, De Kon.
6. Syringopora serpens (?), Linn.
7. Monticulipora (?) Bowerbanki, M. Edw. and J. H.
8. Leptæna quinquecostata, McCoy.
9. Strophomenes pecten, Linn.
10. „ filosa (?), Sow.
11. „ compressa, Sow.

LUDLOW GROUP—*contd.*

13. Favosites multipora (?), Lonsd.
14. „ fibrosa, Goldf.
15. „ gothlandica, Fougt.
16. Propora tabulata, Lonsd.
17. Plasmopora petaliformis, Lonsd.
18. Heliolites megastoma, McCoy.
19. „ Murchisoni, M. Edw. and J. H.
20. Chonetes striatella, Dalm.
21. Pentamerus Knightii, Sow.
22. Euomphalus pleurophorus, De Kon.
23. „ (Omphalotrochus) Clarkei, De Kon.
24. Illænus Wahlenbergii (?), Barr.
25. Encrinurus punctatus, Brünn.
26. Bronteus Partschii, Barr.
27. Harpes ungula, Sternb.

LLANDOVERY GROUP—*contd.*

12. Pentamerus oblongus, Sow.
13. Atrypa reticularis, Linn.
14. „ hemisphærica, Sow.
15. Retzia Salteri, Dav.
16. Spirifer crispus, Hising.
17. Meristella tumida (?), Dalm.
18. Pterinea pumila, De Kon.
19. „ ampliata, Phillips.
20. Euomphalus solarioïdes, De Kon.
21. Conularia Sowerbyi, Defi.
22. Orthoceras Ibex, Sow.
23. Entomis pelagica, Barr.
24. Staurocephalus Clarkei, De Kon.
25. Cheirurus insignis, Bayr.
26. Encrinurus Barrandei, De Kon.
27. Cromus bohemicus, Barr.
28. „ Murchisoni, De Kon.
29. Calymene Blumenbachii, Brong.
30. Proetus Stokesii (?) Murch.
31. Lichas sp. (?).
32. Bronteus goniopeltis, De Kon.

An examination of these tables shows the following facts:—

1st. That the species belong almost half and half to the upper beds and the lower respectively of the most recent epoch of the Silurian Period.

2nd. That the greater part of the species in the first column is made up of Actinozoa and Crustacea, while the Mollusca and Crustacea form almost exclusively the second.

3rd. That Graptolites are entirely wanting, whilst a large number of these organisms were recorded in 1861 by Professor McCoy, and more recently by Mr. R. Etheridge, junr., in the Silurian of Victoria. It must be pointed out that these savants have identified the rocks that have yielded the material used in their researches with those which are known in England as the Bala, belonging to a lower horizon than those in which were collected the specimens submitted to me; but which, up to the present, have not been shown to occur in New South Wales.

PART II.

DEVONIAN SPECIES.

Division—**PROTOZOA**.

Class—**RHIZOPODA.**

Order—**SPONGIDA.**

Genus—ARCHÆOCYATHUS, *Billings*.

Among the genera comprised in the order Spongida, without doubt one of the most important is that which Mr. Billings has discovered in the Potsdam Sandstone of Canada, and which he has described under the name of *Archæocyathus*.

It is to this genus that I refer, without, however, being quite certain that it belongs to it, a species of which Mr. Clarke has sent me two specimens. But as their preservation leaves much to be desired, it is impossible to be more definite about them. As to the species, it appeared to me different to any with which I could compare it, and it is described under the following name:—

Archæocyathus? Clarkei, *L. G. de Koninck*.[1]

Pl. II, fig. 1.

As I have at my disposal only imperfect specimens of this species, it is not easy to define it. It appears to be composed of a layer only eight to ten millimetres thick, but fairly well developed in height and breadth, and irregularly folded, thus forming fairly deep cavities of very variable shape. The outer wall of the sponge mass, properly speaking, is often furnished with irregular protuberances, two to three millimetres in diameter at their base and pierced by small openings which are easily apparent, characters which agree fairly well with those of *Archæocyathus*. I have not been able to examine the inner surface. The part between the two surfaces has a more or less irregular spongy structure, which, in transverse sections has the appearance of ridges perpendicular to the surfaces. By removing the outer wall of the sponge, the netted structure of the inner mass is apparent; the meshes of this net are at first small and almost the same size, while beneath these they are found to be larger and less regular, and mostly produced by radiating branches which resemble pretty well the shape of some species of *Fenestella*. (Pl. II, Fig. 1*b*.)

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[1] [*Vide* G. J. Hinde, Quart. Journ. Geol. Soc., 1889, XLV, p. 127.—W.S.D.]

I have not seen any spicules in it.

Locality.—This species has been found in a dark grey argillaceous limestone on the banks of the Murrumbidgee, near Yass. As one of the specimens is associated with *Leptæna nobilis*, McCoy, it is impossible to have any doubt as to its Devonian age.

Division—CŒLENTERATA.

Class—ACTINOZOA.

Order—RUGOSA.

Genus—PHILLIPSASTREA, *A. d'Orbigny.*

PHILLIPSASTREA VERNEUILII, *Milne Edwards and J. Haime.*

Phillipsastrea Verneuilii, Milne Edwards and J. Haine, 1851, Polyp. Foss. Terr. Pal, p. 447, pl. 10, fig. 5.

„ „ *Idem*, 1860, Hist. Nat. Coralliaires, III, p. 436.

Coral with flat or slightly convex surface, made up of thin layers, often directly superimposed. Corallites with confluent septal-costal rays almost equal to one another, sometimes slightly sinuous and continuous, to the number of twenty-eight to thirty-two, directly from one individual to another. Calicinal cup well marked, surrounded by a projecting ridge, and possessing a rather thin columella extending to the level of the surrounding ridge.

Dimensions.—Diameter of the corallites, ten to twelve millimetres; that of the ridge, five or six millimetres.

Horizon and Localities.—This species has been collected by E. de Verneuil in the Devonian of Wisconsin (United States); it is probable that the two specimens found by Mr. Clarke at Cope's Gully, near Hanging Rock, in the leads, also belong to this formation.

Genus—CAMPOPHYLLUM, *Milne Edwards and J. Haime.*

CAMPOPHYLLUM FLEXUOSUM, *Goldfuss.*

Cyathophyllum flexuosum, Goldfuss, 1826, Petref. Germ., I, p. 57, pl. 17, fig. 3a, 3b.
,, *turbinatum,* J. Phillips, 1841, Pal. Foss. Cornwall, p. 8, pl. 7, fig. 9.
,, *flexuosum,* Michelin, 1845, Icon. Zooph., p. 183, pl. 47, fig. 6.
Campophyllum ,, Milne Edwards and J. Haime, 1851, Polyp. Foss. Terr. Pal., p. 395, pl. 8, fig. 4.

Coral fairly long, often bent and twisted, growth ridges thick and large and with thin epitheca. Septa alternately a little unequal, and about fifteen in number. Tabulæ almost flat, close; interseptal spaces filled with small vesicles.

Dimensions.—Length, eight to ten centimetres; diameter, twelve to fifteen millimetres.

Horizon and Localities.—This species is not rare in the Upper Devonian of the Eifel and in Belgium. The Australian specimen I have before me comes from Quedong. It is enveloped in a mass of some size of *Chætetes Goldfussi,* Milne Edw. and J. Haime.

Genus—CYATHOPHYLLUM, *Goldfuss.*

1. CYATHOPHYLLUM VERMICULARE, *Goldfuss.*

Cyathophyllum vermiculare, Goldfuss, 1826, Petref. Germ., I, p. 58, pl. 17, fig. 4.
Cystiphyllum ,, A. d'Orbigny, 1850, Prodr. Pal., I, p. 106.
Cyathophyllum ,, Milne Edwards and J. Haime, 1851, Polyp. Foss. Terr. Pal., p. 363.

Coral simple, very long, bent or twisted, growth ridges very prominent, and epitheca strongly folded. Circular calice not deep. Septa thin and toothed, alternately long and short; their number, which is very variable, may reach one hundred. The long septa reach the centre, and there bend slightly.

Dimensions.—Length, twelve to fifteen centimetres; diameter, two or three centimetres; depth of the calice, one and a half centimetres.

Horizon and Localities.—Rather common in the Eifel Devonian. In Australia it occurs at Calalamine and Yarralumla. The majority of the specimens from the last two localities are in rather bad preservation, and have been much worn.

2. CYATHOPHYLLUM OBTORTUM, *Milne Edwards and J. Haime.*

Strombodes vermiculare, Lonsdale, 1840, Trans. Geol. Soc. London, V (2), p. 703, pl. 58, fig. 7 (*non. Cyath. vermiculare*, Goldf.).
„ ***vermicularis***, J. Phillips, 1841, Pal. Foss. Cornwall, p. 11, pl. 7, fig. 14.
Cyathophyllum obtortum, Milne Edwards and J. Haime, 1851, Polyp. Foss. Terr. Pal., p. 566.
„ „ *Idem, idem*, 1852, Brit. Foss. Corals., p. 225, pl. 59, fig. 7.

Corallum very long, generally subcylindrical, rarely turbinate, covered with a somewhat thin epitheca; growth ridges large and little regular, Calice circular. Thirty to forty very thin primary septa, bending at some distance from the outer edge and twisting with each other at the centre; these septa alternate with an equal number of shorter septa, whose length is but a third of the total diameter of the corallum. The outer portions of the visceral chambers are occupied by a considerable number of vesicles, which can be seen with the greatest ease.

Dimensions.—One of the Australian specimens that I have before me measures eleven centimetres, though it has been broken off at both ends. I am of opinion that when perfect it must have measured at least twenty centimetres in length. The diameter is four centimetres.

Horizon and Localities.—This species has been founded at Moara Creek, near Yass, and at Quedong in a greyish limestone. In England it is found in the neighbourhood of Torquay.

3. CYATHOPHYLLUM DAMNONIENSE, *Lonsdale.*

Cystiphyllum Damnoniense, Lonsdale, 1840, Trans. Geol. Soc. London, V (2), p. 703, pl. 58, fig. 11.
„ „ J. Phillips, 1841, Pal. Foss. Cornwall, p. 9, pl. 4, fig. 11.
Cyathophyllum Damnoniense, Milne Edwards and J. Haime, 1851, Polyp. Foss. Terr. Pal., p. 371.
„ „ *Idem, idem*, 1852, Brit. Foss. Corals., p. 225, pl. 50, fig. 1.

Corallum simple, subturbinate, more or less curved, epitheca thin, growth ridges faintly marked. Septa about one hundred in number, alternately very unequal, very thin and slightly bent towards the centre. Vesicular tissue very compressed, slightly regular, [vescicles] appreciably smaller and more numerous in the outer region.

Dimensions.—According to Milne Edwards and J. Haime the diameter of large examples of this species may attain the size of eight centimetres; that of the Australian specimens submitted to me is not more than half the width.

Horizon and Localities.—It occurs in Australia, at Yarralumla and Cope's Gully; in England in the Devonian of Torquay and Plymouth,

4. CYATHOPHYLLUM HELIANTHOIDES, *Goldf.*

Cyathophyllum helianthoïdes, Goldfuss, 1826, Petref. Germ., I, p. 64, pl. 20, fig. 2.
Favastrea helianthoïdea, De Blainville, 1830, Dict. Sc. Nat., LX, p. 341.
Astrea helianthoïdes, Lonsdale, 1841, Trans. Geol. Soc. London, V (2), p. 697.
Discophyllum helianthoïdes, A. d'Orbigny, 1850, Prodr. Pal., I, p. 106.
Cyathophyllum „ Milne Edwards and J. Haime, 1858, Polyp. Foss. Terr. Pal., p. 375, pl. 8, fig. 5.
„ „ *Idem, idem,* 1852, Brit. Foss. Cor., p. 227, pl. 51, fig. 1.

This coral, of which the calice may attain a very great diameter, is simple or compound. In the former of these conditions it is usually very short and subturbinate; the edges of the calice are often reverted so as to form a fairly prominent ridge around the central portion which is excavated [to form] a fossula; there are, however, varieties in which this ridge is not present and in which the calice is more regularly expanded. It is with this last mentioned variety that the only Australian specimen I have seen agrees. Its septa are thin, apart, seventy in number, reaching right to the centre and of the same thickness throughout their length. It is two centimetres long and eight centimetres in diameter.

Horizon and Localities.—This is one of the most characteristic species of the Devonian limestone of the Eifel. In Australia it is found in the Yass District.

Genus—AMPLEXUS, *Sowerby.*

AMPLEXUS SELWYNI, *L. G. de Koninck.*

Pl. II, fig. 2.

Corallum of medium size, basal extremity regularly conical or slightly curved. Epitheca very thin; the septal ridges are very plain, very regular, separated from one another by furrows of the same width as themselves, and crossed by several faint growth ridges. In adult specimens the septa are sixty in number; they are very small and do not extend more than a millimetre into the interior of the calice, which is about a centimetre deep. The tabulæ are very large, slightly waving, and rather close to one another (Pl. II, Fig. 2*b*); the septal fossula is indistinct and very small.

Dimensions.—Length, five to six centimetres; diameter, two centimetres.

Relations and Differences.—This species has some resemblance to *Amplexus Yandelli*, Milne Edwards and J. Haime; it differs from it mainly in the shorter and less twisted shape, in the slight development of its septa, as well as in the shallowness of the septal fossula.

Horizon and Locality.—This *Amplexus*, which I dedicate to the learned geologist who, even as the Rev. W. B. Clarke, has explored important regions of Australia, was found in an argillaceous limestone in the Yass District, and in a blue-grey limestone at Quedong.

Genus—CŒNITES, *Eichwald.*

CŒNITES EXPANSUS, *L. G. de Koninck.*

Pl. II, fig. 3.

Corallum, with a rather broad base, spreading in large laminæ of a uniform thickness of about two millimetres; these laminæ are folded in various ways, and joining at the points of contact, produce cavities of very variable size and shape. The calices are small, close and little prominent; in shape they are subsemilunar; the convex side is fairly regular, whilst the opposite, that directed towards the base, is furnished with two small teeth separated by a medium hollow; the diameter is not more than a quarter millimetre. The two sides of the laminæ which compose the corallum are quite similar, and a fracture shows that the corallites trend obliquely from each side, above downwards, and meet one another at a fairly acute angle at about the middle of the laminæ.

Relations and Differences.—This species is easily distinguished from all those known at present by its great size and the regular thickness of the laminæ, as well by the small dimensions of its calices, which in shape alone resemble those of *Cœnites juniperinus*, Eichwald.

Horizon and Locality.—A single specimen of this beautiful species has been found in a deep black limestone on the banks of the Murrumbidgee, in the Yass District.

Genus—BILLINGSIA, *L. G. de Koninck.*[1]

Corallum composed of compressed corallites, connected by their walls and communicating freely with each other by means of mural pores. The calices are small, oval, and furnished with several septal striæ. Tabulæ appear to be wanting.

I have thought it right to establish this genus on account of certain corals which from their form have great resemblance to some species of *Favosites* and *Alveolites.* In fact they grow like these, in rounded or dendroid mass with radiating corallites, but differing from the first [*Favosites*] in the absence of tabulæ and in the arrangement of the mural pores, and from the second [*Alveolites*] in the shape of the calices which show no trace of septal processes. This same character excludes them from *Cœnites.* This genus appears to constitute a link between *Aulopora* and *Syringopora.*

BILLINGSIA ALVEOLARIS, *L. G. de Koninck.*

Pl. II, fig. 4.

Corallum a rounded or dendroid mass, corallites very numerous, arranged obliquely to the axis in the branching portions and converging towards the centre in the rounded or gibbous masses; in diameter they do not exceed one half millimetre. The calices are pretty regular, and from their position, oblique to the surface, appear a little angular; the margins are thin and the septal striæ are but little apparent; the oval outline of the corallites is only seen when they are examined perpendicular to their axis; a longitudinal section proves that they communicate directly with one another by relatively large mural pores arranged at variable distances almost in the same way as in several species of *Syringopora,* with the difference that the corallites of *Syringopora* are not directly connected to one another by their walls.

Horizon and Locality.—Three specimens of this species have been collected in the Yass Bistrict, on the banks of the Murrumbidgee, in a black compact limestone, on the surface of which all the structure appears clearly owing to their being silicified and weathered by long exposure to atmospheric influences.

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[1] [This genus has been proved to be synonymous with *Alveolites*, hence the species is now known as *Alveolites alveolaris, vide* R. Etheridge, Junr., and A. H. Foord, Ann. Mag. Nat. Hist., 1884, XIV, p. 176, pl. 6, fig. 1–1c, and R. Etheridge, Junr., Geology and Palæontology of Queensland, 1892, p. 53, pl. 2, figs. 1–3a.—W.S.D.]

Genus—SYRINGOPORA, *Goldfuss.*

SYRINGOPORA AULOPOROIDES, *L. G. de Koninck.*

Pl. III, fig. 1.

Corallum forming masses of considerable size. Corallites short, at irregular distances from one another, and growing in every direction, very seldom united by lateral processes. They usually commence by being rather creeping, and when they attain a length of five to six millimetres buds are given forth which grow longer and rise more or less vertically, but their growth is never great, nor does it exceed three centimetres. Epitheca very thick. Aperture of the calice circular, edges rounded and slightly turned in.

Dimensions.—The diameter of the corallites varies only from one to one and a half millimetres.

Relations and Differences.—In the dimension of the corallites and the shape of the calices this species resembles *S. cæspitosa*, Goldfuss, from which it differs in the small length, the little regularity in the direction of these same corallites, and in the space which separates them from one another.

Horizon and Locality.—One fairly large specimen has been found at Moara Creek, to the north of Tamworth.[1] It is associated with *Alveolites subæqualis*, Milne Edwards and J. Haime, and occurs in bright grey dolomitic limestone.

Genus—ALVEOLITES, *de Lamarck.*

1. ALVEOLITES OBSCURUS, *L. G. de Koninck.*

Pl. I, fig. 11.

This coral consists of two branches only, almost at right angles to one another; they are slightly compressed and only three millimetres in diameter. The calices are very oblique, subtriangular in shape, edges very thin, but little regular and arranged rather close to one another; the septal projections are very slightly apparent.

Horizon and Locality.—This *Alveolites* is very nearly related to *A. labiosa*, Billings, from which it is distinguished only by the number and the closeness of the calices. It has been found in a compact black limestone on the banks of the Murrumbidgee, in the Yass District.

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[1] [It is possible that the locality mentioned here and on succeeding pages by De Koninck as "Moara Creek, to the north of Tamworth," and "Mowara, in the neighbourhood of the Moonbi Ranges," is that now known as "Moor Creek." It must be pointed out, however, that Attunga Creek, a few miles to the north of "Moor or "Moore Creek," is called "Mooar Creek" on an old Colony Map.—W.S.D.]

2. ALVEOLITES SUBÆQUALIS, *Milne Edwards and J. Haime.*

Calamopora spongites, Michelin, 1845, Icon. Zooph., p. 189, pl. 48, fig. 8 (*non Goldfuss*).
Alveolites subæqualis, Milne Edwards and J. Haime, 1851, Polyp. Foss. Terr. Pal., p. 256, pl. 17, fig. 4.

Corallum ramose, branches often rather slender, but they may attain up to two centimetres in diameter. Calices a little unequal, transverse, rarely a millimetre in width and two thirds of a millimetre high. The inner projection of the lower margin is fairly well developed.

Horizon and Localities.—This species is rather abundant in the Upper and Middle Devonian of Belgium, France, and the Eifel. It is contained in great numbers in a block of greyish dolomite, collected at Mowărá, in the neighbourhood of the Moonbi Range.

Genus—FAVOSITES, *de Lamarck.*

1. FAVOSITES GOLDFUSSI, *A. d'Orbigny.*

Calamopora gothlandica (pars), Goldfuss, 1826, Petref. Germ., I, p. 73, pl. 26, fig. 3*b* and 3*c* (*cæt. excl.*)
Favosites ,, Phillips, 1840, Pal. Foss. Cornwall, p. 16, pl. 7, fig. 21.
,, ,, (?) Lonsdale, 1845, In Strzelecki's Phys. Descr. N. S. Wales and V. D. Land, p. 266.
,, *Goldfussi*, A. d'Orbigny, 1850, Prodr. Pal., I, p. 107.
,, ,, Milne Edwards and J. Haime, 1851, Polyp. Foss. Terr. Pal., p. 235, pl. 20, fig. 3.
,, ,, *Idem, idem*, 1852, Brit. Foss. Corals, p. 214, pl. 57, fig. 3.

Corallum in a rounded mass, surface more or less convex, sometimes pyriform. Calices little regular, often interspersed with small ones. Walls covered with small spines on the inner surface and with unequal sides. Mural pores fairly generally arranged in two vertical rows.

Dimensions.—Diameter of corallum eight to ten centimetres; diameter of large calices two to three millimetres.

Horizon and Localities.—This species has been collected by Strzelecki in the plains of the Yass District, and by the Rev. W. [B.] Clarke at Yarralumla and probably also at Yarradong and Tuena, in a black argillaceous limestone, also at Limokilns [Limekilns] in a greyish limestone. It is widely distributed in the Devonian of Belgium, France, England, Germany, Russia, and America.

2. FAVOSITES BASALTICA, *Goldfuss.*

Calamopora basaltica, Goldfuss, 1826, Petref. Germ., I, p. 78, pl. 26, fig. 4*c* and 4*d* (*cæt. excl*).

Favosites gothlandica, J. Hall, 1843, Geol. N. York, p. 137, fig. 2.

„ *basaltica,* Milne Edwards and J. Haime, 1851, Polyp. Foss. Terr. Pal., p. 236.

Corallum a rounded mass, sometimes of very considerable size. Corallites rather long, radiating, subequal, often taking the form of a hexagonal prism. Mural pores almost always forming a single series in the middle of each wall and a millimetre apart. With the exception of the upper, on which may be distinguished usually four small depressions, the tabulæ are flat, smooth, and about a millimetre apart.

Horizon and Localities.—This coral has been found in the Devonian of Nehou, of the Eifel, and of the United States. Mr. Clarke has collected it in a greyish limestone at Shoalhaven Gullies and at Calalamine.

3. FAVOSITES ALVEOLARIS, *Goldfuss.*

Calamopora alveolaris, Goldfuss, 1826, Petref. Germ., I, p. 77, pl. 26, fig. 1*a* and 1*c* (fig. 1*b excl., non* Keyserling).

Favosites „ Blainville, 1831, Dict. Sc. Nat., LX, p. 367.

„ „ Milne Edwards and J. Haime, 1851, Polyp. Foss. Terr. Pal., p. 234.

Corallum rather massive, calices relatively large but rather unequal. The tabulæ have near the wall four small shallow depressions; they are arranged horizontally and regularly spaced. The mural pores are rather close and occupy the angles of the visceral chamber.

Dimensions.—Diameter of large calices about three millimetres.

Horizon and Localities.—A single specimen of this species has been found at Calalamine. It occurs in the Devonian of Ferques, the Eifel, and North America.

4. FAVOSITES POLYMORPHA, *Goldfuss.*

Calamopora polymorpha, Goldfuss, 1826, Petref. Germ., I, p. 79, pl. 27, fig. 2*b*, 2*c*, 2*d*, 3 (*cæt. excl.*).
Favosites „ Dale Owen, 1844, Rept. Geol. Explor., p. 74, pl. 12, fig. 13.
„ „ Milne Edwards and J. Haime, 1851, Polyp. Foss. Terr. Pal., p. 237.

Corallum an irregular mass, composed of prismatic corallites of rather unequal diameter. Tabulæ horizontal, about half a millimetre apart; mural pores small, rather close.

Dimensions.—Diameter of the corallites varying from a half to one and a half millimetres.

Horizon and Localities.—A single specimen of this species has been found on the banks of the Macleay River in a violet coloured rather compact limestone containing a large number of fragments of crinoid stems converted into white calcite. It has been found in the Devonian of the Eifel, Nehou, and Viré in France, of the Province of Léon in Spain, and in the State of Iowa in America.

5. FAVOSITES RETICULATA, *Blainville.*

Calamopora spongites, var. *ramosa*, Goldfuss, 1826, Petref. Germ., I, p. 80, pl. 28, fig. 2.
Alveolites reticulata, Blainville, 1831, Dict. Sc. Nat., LX, p. 469.
Favosites orbignyana, De Verneuil and J. Haime, 1850, Bull. Soc. Geol. France, II (2), p. 162.
„ *reticulata*, Milne Edwards and J. Haime, 1851, Polyp. Foss. Terr. Pal., p. 241.

Corallum dendroid, formed of branches one to two centimetres in diameter, and having the habit of bifurcating at various points of growth and in different directions. The corallites spring from the centre of each branch, and are directed obliquely and curving towards the periphery. Walls, thick; calices, a little unequal, diameter about a millimetre.

Horizon and Localities.—This species is very abundant in the Devonian of Europe. Several specimens in rather bad preservation have been collected at Quedong, and another, very well preserved, near Yass. The first are found in a blackish argillaceous limestone, and the second in a pale-grey dolomite; others again occur on the banks of the Murrumbidgee, Mowărá, and Limekilns.

6. FAVOSITES FIBROSA, *Goldfuss*.

Calamopora fibrosa, var. *tuberoso-ramosa*. Goldfuss, 1826, Petref. Germ., I, p. 82, pl. 28, fig. 2a and 3b (*cæt. excl.*).

Favosites microporus, Steininger, 1831, Mém. Soc. Geol. France, I, p. 337.

Calamopora fibrosa, var. *globosa*. Goldfuss, 1833, Petref. Germ., I, p. 215, pl. 64, fig. 9.

Alveolites fibrosa, Lonsdale, 1839, Murchison's Silurian System, p. 683, pl. 15, fig. 1 and pl. 15 bis, fig. 6 (fig. 7 *excl.*).

Favosites „ Phillips, 1841, Pal. Foss. Cornwall, p. 17, pl. 9, fig. 25.

Stenopora „ McCoy, 1851, Brit. Pal. Foss., p. 24.

Favosites „ Milne Edwards and J. Haime, 1851, Polyp. Foss. Terr. Pal., p. 244.

„ „ *Idem idem*, 1852, Brit. Foss. Corals, p. 217, pl. 48, fig. 3, and p. 61, pl. 61, fig. 3.

Corallum a subglobose or lobate mass. Corallites practically equal, very small, prismatic, only a third of a millimetre in diameter, radiating from the base to the surface, and curving slightly and increasing by interposition. Mural pores very close, arranged in single vertical series on the angles of the prisms, and only visible by means of a magnifying glass.

Horizon and Localities.—This species seems to have appeared before the deposition of the lower beds of the Silurian in which it is found in England, and to have survived till the formation of the Middle Devonian, where it occurs in the Eifel. Two of the specimens collected by the Rev. W. [B.] Clarke appear to me to be Devonian, one being associated with *Campophyllum flexuosum*, Goldfuss, and the other with *Strophalosia productoides*. They occur at Quedong; a third, probably Silurian, has been found at Yarralumla.

Genus—HELIOLITES, *Dana*.

HELIOLITES POROSA, *Goldfuss*.

Heliolithe pyriforme a étoiles, Guettard, 1770, Mém. sur les Sc. et les Arts, III, p. 454, pl. 22, fig. 13 and 14.
Astrea porosa, Goldfuss, 1826, Petref. Germ., I, p. 64, pl. 21, fig. 7.
Heliopora pyriformis, Blainville, 1831, Man. d'Actinol., p. 392.
Porites „ Lonsdale, 1840, Trans. Geol. Soc. London, V (2), pl. 58, fig. 4.
Porites (?) „ Phillips, 1841, Pal. Foss. Cornwall, p. 14, pl. 7, fig. 19.
Palæopora „ McCoy, 1851, Brit. Pal. Foss., p. 67.
Heliolites porosa, Milne Edw. and J. Haime, 1851, Polyp. Foss. Terr. Pal., p. 218.
„ „ *Idem, idem*, 1852, Brit. Foss. Corals, p. 212, pl. 47, fig. 1.

Although the single specimen that I refer to this species is in a bad state of preservation, still I think I am not wrong in its determination. The characters of the species are besides so well marked and easily grasped that it is almost impossible to confuse it with any other, and I will not detail them in this work.

Horizon and Localities.—This species is found rather frequently in the Devonian of the Eifel; it is a little rarer in the same formation in Devonshire. The specimen I have before me has been collected at Mowara, and occurs in a rolled piece of dolomite associated with *Favosites fibrosa*, Goldfuss.

Division—MOLLUSCOIDEA.

Class—BRACHIOPODA.

Genus—DISCINA, *Lamarck*.

DISCINA ALLEGHANIA, *J. Hall*.

Pl. VI, fig. 1.[1]

Discina alleghania, J. Hall, 1861, Ann. Rept. Regents State Cabinet N. York, XIII, p. 77.
„ „ *Idem*, 1867, Pal. N. York, IV, p. 25, pl. 1, fig. 17.

Shell almost completely circular, posterior side a little less developed than the anterior. The lower or ventral valve, which is the only one known to me, is undulated; and while the anterior portion is concave, the opposite side is slightly arched, so that an antero-posterior section is represented by a sigmoidal line, while the transverse shows a line slightly but uniformly curved. The fissure, of which the anterior extremity commences almost at the central point, is oval, elongate, and rather narrow. All the exterior surface is covered by fine concentric vertical lamellæ, separated from one another by furrows a little broader than the lamellæ, and about fifty in number.

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[1] [Pl. IV, fig. 16, in original.—W.S.D.]

Dimensions.—Antero-posterior diameter, forty millimetres; transverse diameter, thirty-four millimetres; width of the fissure, two millimetres.

Relations and Differences.—In size and ornamentation this species resembles ***Discina glebosa,*** de Ryckholt, which this author has classed with ***Helcion,*** with which it has no relation. It differs from it in its more rounded shape and in the greater number of concentric lamellæ.

Horizon and Localities.—A single specimen of this species has been collected in the black Devonian limestone from the neighbourhood of Yass. The same piece of stone contains a rather well exposed specimen of ***Murchisonia angulata,*** d'Archiac and de Verneuil. Mr. J. Hall discovered it in the Chemung Group at Hobbieville, Alleghany County, New York State.

Genus—STROPHALOSIA, *King.*

STROPHALOSIA PRODUCTOÏDES, *Hall.*

Orthis productoides, Murchison, 1840, Bull. Soc. Géol. France, XI (1), p. 254, pl. 2, fig. 7.

Leptæna caperata, J. de C. Sowerby, 1840, Trans. Geol. Soc. London, V (2), p. 704, pl. 53, fig. 4, and pl. 54, fig. 3.

„ „ J. Phillips, 1841, Pal. Foss. Cornwall, p. 58, pl. 25, fig. 98.

Productus Murchisonianus (partim), L. G. de Koninck, 1847, Recherches Anim. Foss., I, p. 138, pl. 16, fig. 3 (*fig. cæt. excl.*).

Strophalosia productiodes, T. Davidson, 1864, Mon. Brit. Brach., p. 97, pl. 191, fig. 13–25.

Shell suborbicular or subsemicircular, hinge line a little shorter than the transverse diameter. Ventral valve slightly but regularly arched, non-sinuate, ears obtuse, beak small and little prominent. Area rather narrow, slightly triangular, and provided with a faintly visible pseudo-deltidium. Dorsal valve concave and little separated from the opposite valve, whose curvature it follows. Area almost linear. The surface of the ventral valve is ornamented with concentric growth lines, a little wavy, often irregular, as well as a large number of elongated tubercles, fairly generally arranged in quincunx and acting as the base of very fine spiniform tubes. A line of these tubercles usually exists along the hinge margin. The surface of the dorsal valve is provided with growth lines similar to those that ornament the ventral valve and small furrows corresponding to the tubercles of the other.

Dimensions.—Length, twenty-five to thirty millimetres; breadth, twenty-seven to thirty-three millimetres; thickness, three millimetres.

Observation.—It seems to me very probable that several of the species described by Mr. J. Hall under the generic name *Productella* are in reality only varieties of this form, in which the ornamentation varies to such an extent that it is difficult to find two specimens exactly alike one another; but as I have not at my disposal the necessary material to enable me to speak definitely, I prefer to leave the discussion of this question to others.

Horizon and Localities.—This species is rather common in the Upper Devonian of England and Belgium. Mr. W. [B.] Clarke has sent me a single specimen of it, collected from a yellowish-white phtanite at Kempsey. It is associated with *Chonetes Hardrensis*, Phillips.

Genus—CHONETES, *Fischer de Waldheim.*

1. Chonetes Hardrensis, *J. Phillips.*

Orthis Hardrensis, J. Phillips, 1841, Pal. Foss. Cornwall, p. 138, pl. 58, fig. 104, and pl. 60, fig. 104.*

Leptæna (*Chonetes*) *Hardrensis*, McCoy, 1855, Brit. Pal. Foss., p. 454.

Chonetes Hardrensis, T. Davidson, 1864, Mon. Brit. Dev. Brach., p. 14, pl. 19, fig. 6, 7, 8 (*fig. cæt. excl.*), *non Idem.*, Mon. Brit. Carb. Brach., p. 186, pl. 47, fig. 12–16.

Shell transverse, subsemicircular, cardinal line straight, angular or slightly rounded at its extremities. Each of the two valves possesses a narrow area of triangular shape, very elliptical; the area of the dorsal valve is a little higher and consequently more appreciably triangular than the opposite valve. The ventral valve is slightly but pretty regularly arched in the median portion and depressed towards the lateral extremities. The beak, little developed and slightly curved, does not project beyond the hinge line which is provided on either side of the beak with four or five rather short and slightly curved tubes. The dorsal valve is faintly concave and follows at a slight interval the contour of the opposite valve. The exterior surface of the two valves is ornamented with fine radiating ribs which increase slightly in number towards the margin either by a simple forking or by intercalation, so as to preserve almost the same thickness, at any rate over half their extent; these ribs are not angular, but very slightly granular; on well preserved specimens they are sixty to seventy in number.

The ventral valve is provided, on the interior, with a median septum faintly marked, but extending from the beak right to the lower third of the shell; on its flank (sides) may be seen the impressions, often very indistinct, of the adductor and cardinal muscles; almost all the inner surface is covered with small close-set prickles, arranged in radiating rows, corresponding exactly with the direction of the external ribs. I have not had an opportunity to examine the internal structure of the dorsal valve.

Dimensions.—The width of the largest specimens I have before me does not exceed twenty millimetres; their length is twelve, and thickness one and a half millimetres.

Relations and Differences.—There is no species of this genus about the limits and characters of which there is less agreement than this. My learned friend, Mr. Davidson, is convinced that the Carboniferous species he has described under the name of *Chonetes Hardrensis*, is identical with that which J. Phillips described under the same name, and which comes from the Upper Devonian of the neighbourhood of Barnstaple, and this opinion is so positive that he thinks there can be no doubt on the subject.[1] In spite of the great admiration I have for his works, and the great esteem in which I hold him, I cannot bring myself to agree with his opinion. I have a strong conviction that the two *Chonetes* I have just referred to are different species, and this opinion is based on the study of a great number of specimens coming from different localities, and even from different countries. I have, moreover, obtained possession of, for comparison, specimens from the same locality as J. Phillips obtained those he described and figured, and for this I am indebted to the kindness of Mr. Townshend W. Hall, of Barnstaple. I trust my learned confrére of the Geological Society of London, will allow me to express publicly my indebtedness to him.

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[1] Mon. Brit. Dev. Brach., p. 95.

Although in the last description I gave of *Chonetes Laguessiana*[1] I have already detailed the principal differences that exist between this Carboniferous species and the Devonian *Chonetes Hardrensis*, I think it would be useful to give them again :—

The Devonian species never attains the size of the Carboniferous, its outline is more regularly semicircular; the number of radiating ribs is always less than in a Carboniferous specimen of the same size; these ribs are less prominent and less angular, and the furrows separating them are not so deep; their bifurcations are less numerous; they are much more noticeable on the cardinal edge than in the Carboniferous *Chonetes;* the ventral valve is less convex and consequently the dorsal valve is less concave; the muscular impressions in the dorsal valve are less developed, but on the other hand the median septum is relatively longer, though less prominent; the granulations that ornament the interior surface of the same valve are less noticeable but more numerous; as I have already remarked they are arranged in radiating rows corresponding to the ribs on the outer surface, while this regularity does not obtain in the Carboniferous species, in which they are besides much more developed, chiefly towards the free margins of the shell; finally, the number of spiniform tubes on the hinge line is greater in *C. Laguessiana* than in *C. Hardrensis*, on which I have not been able to count more than five on either side of the beak, while I seen up to eight on the Carboniferous species.

Horizon and Localities.—According to Mr. Davidson this species is very common in the slates and sandstones of the North of Devonshire, and is not rare in the neighbourhood of Barnstaple. It is less common in the Devonian *Receptaculites Neptuni*, Def., beds of Charlemont near Givet, and of Belgium. In Australia Mr. Clarke has collected some good specimens of it in a dark grey limestone in the Yass District. They are associated with *Spirifer Glinkanus*, De Verneuil. A rather badly preserved specimen found in a yellowish psammite at Kempsey belongs perhaps to this species.

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[1] L. G. de Koninck, Recherches sur les Anim. Foss., II, p. 40.

2. CHONETES CORONATA, *Conrad.*

Chonetes sordida ? Sowerby, 1840, Trans. Geol. Soc. London, V (2), pl. 53, fig. 5 and 16.

Strophomena carinata (for *coronata*). Conrad, 1842, Journ. Acad. Nat. Sc. Philadelphia, VIII, p. 257.

" *syrtalis*, *Idem*, 1842, *ibid.*, p. 254, pl. 14, fig. 1.

Chonetes coronata, J. Hall, 1867, Pal. N. York, IV, p. 133, pl. 21, fig. 9–12.

Shell transverse, subelliptic, hinge line of the same length or sometimes a little shorter than the width. Ventral valve generally convex, slightly sinuated in the middle, ears depressed. Dorsal valve more or less concave, and following at a slight interval the course of the opposite valve. All the surface is ornamented with a very large number of delicate radiating ribs, subequal, increasing by forking or by interposition. In well-preserved individuals these small ribs are traversed by concentric growth-lines, principally towards the margin.

The hinge-line of the ventral valve is provided on either side of the beak with five to seven spiniform tubes, of which usually two or three only are visible. The area is triangular but very arched.

The interior of the ventral valve, of which I have been able to examine the impression only, shows two rather strong and diverging dental plates, and a thin, very short, median septum; on either side of this may be seen a small impression of elongate oval outline, formed by the adductor muscles, while the impressions of the cardinal muscles are scarcely visible; beyond these impressions and up to within a certain distance of the outer margin, bounded by a slight inflation [ridge] parallel to the margin, all the inner surface is covered by small spines, which produce on the mould small pits similar to pin pricks. The inflated portion itself of the margin only carries a small number of these little pits on its inner portion, while the marginal portion is ornamented by very delicate radiating striæ, which give it a fringed appearance.

I have not had an opportunity of examining the internal structure of the dorsal valve.

Observation.—I am almost certain that this species, which is quite distinct from *C. Hardrensis* in shape, size, and the great number of ribs, is identical with *C. sordida*, Sowerby; but as I am without the facts required to settle this question, I prefer not to attempt it.

Horizon and Localities.—According to Mr. J. Hall this species is not rare in the calcareous shales of the Hamilton Group of the regions bordering Lakes Cayuga, Seneca, and Canandaigua, and many other localities. The specimens collected by Mr. Clarke occur in a mottled phtanite at Kempsey.

Genus—ORTHIS, *Dalman.*

1. ORTHIS INTERLINEATA, *Sowerby.*

Orthis interlineata, Sowerby, 1840, Trans. Geol. Soc. London, V (2), pl. 53, fig. 11, and pl. 54, fig. 14.

" " J. Phillips, 1841, Pal. Foss. Cornwall, p. 63, pl. 26, fig. 106.

" *parallela, Idem*, 1841, *ibid.*, p. 64, pl. 26, fig. 109.

" *interlineata,* McCoy, 1855, Brit. Pal. Foss., p. 384.

" " T. Davidson, 1865, Mon. Brit. Dev. Brach., p. 91, pl. 17, fig. 18–23.

Shell slightly transverse, subelliptic, thin; hinge line shorter than the transverse diameter of the shell; ventral valve slightly convex, with only a narrow area, a little-marked beak, and a very small deltidium; dorsal valve shallower than the opposite one, slightly sinuated in the middle and provided with a linear area.

The external surface of both valves is ornamented by some number of small radiating ribs, slightly angular, commencing at the beak and proceeding in a straight line to the margins; between these ribs, which are the thickest, are developed some other thinner ones, which are at variable distances from the hinge, thus augmenting considerably the number of those that extend to the margin. They are sometimes crossed by faint concentric growth lines.

Dimensions.—Length about eleven millimetres; width twelve millimetres.

Horizon and Localities.—A rather large block of compact black limestone from Yarradong contains some number of examples of this species, which does not appear to be uncommon near Petherwin in England, and Charlemont, near Givet, in France.

2. ORTHIS STRIATULA, *Schlotheim.*

Hysterolithes, Linnæus, 1755, Museum Tessinianum, p. 90, pl. 5, fig. 2.

Terebratulites striatula, Schlotheim, 1813, In Leonhard's Taschenbuch, VIII, pl. 1, fig. 6.

Atrypa ,, Sowerby, 1840, Trans. Geol. Soc. London, V (2), pl. 54, fig. 10.

Orthis resupinata, J. Phillips, 1841, Pal. Foss. Cornwall, p. 67, pl. 27, fig. 115.

,, *striatula,* L. G. de Koninck, 1842, Descr. Anim. Foss. Terr. Carb. Belg., p. 224, pl. 12 bis, fig. 6.

,, ,, Woodward, 1854, Man. Mollusca, pl. 229, fig. 147.

,, ,, T. Davidson, 1855, Mon. Brit. Foss. Brach. Introd., I, pl. 7, fig. 128–135.

,, ,, G. Sandberger, 1855, Verstein. Rhein. Schichtensyst. Nassau, p. 39, pl. 34, fig. 4.

,, ,, T. Davidson, 1865, Mon. Brit. Dev. Brach., p. 87, pl. 17, fig. 4–7.

This species, so wide-spread in the upper and middle beds of the Devonian, has been so well described and figured by different Authors, particularly S. P. Woodward, G. Sandberger, and Mr. Davidson, that I think I may abstain from giving its characters here. I will confine myself to saying that the only specimen from Australia that has been sent to me has a size above the average, as it is four centimetres long and four and a half wide; that it has lost a large portion of the shell, enabling one to see the muscular and vascular impressions of the dorsal valve, which are quite similar to those that S. P. Woodward and Mr. Davidson have so well reproduced from a specimen collected in the Middle Devonian limestone of the Eifel, and presented by me to the British Museum; there cannot be the least doubt as to the specific determination of this species.

Horizon and Localities.—Wherever the Devonian has been recorded the presence of *Orthis striatula* can be proved. It has been found in Belgium, France, England, Spain, Russia, the United States, and even in Persia.

The Australian specimen was found by the Rev. W. [B.] Clarke in a piece of reddish sandstone on the banks of the Allyn River.[1]

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[1] [The area drained by the Allyn River is now considered to be Carboniferous.—W.S.D.]

Genus—LEPTÆNA, *Dalman.*

1. Leptæna ? interstrialis, *J. Phillips.*

Orthis interstrialis, J. Phillips, 1841, Pal. Foss. Cornwall, p. 61, pl. 25, fig. 103.

Leptæna interstrialis ? Schnur, 1853, Beschr. Uebergangsgebirge Eifel Brach., p. 54, pl. 20, fig. 2.

„ *interstrialis,* T. Davidson, 1865, Mon. Brit. Dev. Brach., p. 85, pl. 18, fig. 15–18.

Shell usually transverse, semicircular, greatest width at the hinge line the ends of which are angular and extend a little beyond the sides. The ventral valve is fairly regularly convex while the ventral [dorsal] is concave and follows at a small interval the curvature of the other. The principal characteristic is comprised in the surface ornamentation, which is composed of some number of delicate ribs (twenty to twenty-four) having their origin at the beak and directing radiatingly towards the edges. At some distance from the beak, and in the middle of the clear space between two contiguous primary ribs, are developed others a little thinner than them which also extend to the edge, while all the rest of the surface bears hairlike ribs parallel to the first and to the number of five to six between each pair of secondary ribs.

Observation.—I am not quite certain that the *Leptæna* described and figured by Schnur under the name of *L. interstrialis,* is identical with that which J. Phillips has described under the same name; but not having at my disposal, just now, the material necessary to decide the question, I prefer not to speak definitely on the subject.

Horizon and Localities.—If it be proved that Schnur's determination is correct, this species is found both in the Lower Devonian, at Daleiden, in the Middle Devonian of Blankenheim, of Gerolstein, and of many localities in Devonshire, also in the grey *Receptaculites Neptuni,* Defr., shale of the Givet District. One specimen of it has been collected on the banks of the Murrumbidgee, near Yass, in a piece of reddish sandstone associated with indeterminable fragments of *Fenestella.*

2. LEPTÆNA ? NOBILIS, *M'Coy.*

Leptæna (*Strophomena*) *nobilis,* M'Coy, 1852, Brit. Pal. Foss., p. 316, pl. 2A, fig. 2.

„ *nobilis,* T. Davidson, 1865, Mon. Brit. Dev. Brach., p. 86, pl. 18, fig. 19-21.

Shell subsemi-elliptic, usually a little wider than long, greatest width at the hinge line. Ventral valve rather strongly and regularly arched; ears slightly depressed, projecting slightly beyond the sides, which form an acute angle, a little less than a right angle, with the hinge line. The beak is small and hardly projects beyond the hinge line. The area does not appear to be well developed. The external surface is ornamented with a large number of radiating ribs, twenty to twenty-four of which have their point of origin in the beak, and extend more or less regularly to the margin without much modification in thickness; between these ribs, and at different distances from the beak, others of the same form appear in sufficient number to present an almost equal space between them all—a distance of about a millimetre on the average; the free [unribbed] space is wrinkled, but the ribs are not affected by it; these wrinkles are more marked on the upper than on the lower portion of the valve; they are covered by delicate striæ parallel to the ribs numbering seven to nine to each division. The dorsal valve is concave, follows the contour of the opposite valve, and bears ornaments similar to those that cover the surface of the other.

Dimensions.—Length, thirty-six millimetres; width, forty-two millimetres.

Relations and Differences.—This species has some analogy to the preceding, from which it differs in its greater size, the wrinkled surface, and the greater convexity of the ventral valve.

Horizon and Localities.—Mr. McCoy has found this beautiful species in the Devonian limestones of Teignmonth, and Mr. Davidson has recorded it from the limestone of Woolborough, near Newton Abbot. Of the two specimens that were sent to me by the Rev. W. [B] Clarke, one comes from Yarradong, and the other from the Yass District; they are enclosed in a compact blackish limestone that appears to me to belong to the Middle Devonian, one of the specimens preserving, as well as the *Leptæna,* a fragment of a crinoid stem, in all respects similar to that of *Rhodocrinus crenatus,* Goldfuss, which belongs to that formation.

3. LEPTÆNA SUBÆQUICOSTATA, *L. G. de Koninck.*

Pl. III, fig. 2.

Shell almost as long as broad, of subsemi-elliptic shape; ears slightly curved on themselves, and ending in almost a right angle. Ventral valve fairly regularly arched; beak small, slightly incurved, not prominent; area narrow; fissure triangular, with a very wide base completely closed by the cardinal process of the dorsal valve. This [dorsal valve] is concave and follows the curvature of the ventral valve, leaving but a small space between the two. The outer surface of each valve is ornamented with small radiating almost smooth ribs, which are separated from one another by a small furrow; towards the middle of the shell these ribs increase by forking, and thus preserve an almost equal thickness through their whole length. The internal structure of the valves is unknown to me.

Dimensions.—Length, twenty-six millimetres; width, thirty millimetres; thickness, about two millimetres; number of ribs at the margin about seventy.

Relations and Differences.—In general form this species resembles certain varieties of *S. compressa*, Sow.,[1] and that of *S.* (*Leptæna*) *obscura*, J. Hall,[2] from which it differs in its greater convexity, and in the number and form of its ribs.

Horizon and Locality.—A single specimen of this species has been found in a black Devonian limestone from near Yass.

Genus—PENTAMERUS, *Sowerby.*

PENTAMERUS PUMILUS, *L. G. de Koninck.*[3]

Pl. III, fig. 3.

This little shell is slightly transverse, subglobose. The ventral valve is rather regularly arched; the beak small, although rather strongly incurved, projects a little beyond the hinge line; the outer surface is ornamented with fifteen slightly angular folds, sharply separated from one another by deep furrows; all these folds commence at the beak and continue to the edge without bifurcating; of these folds, the mesial is a little stouter than the others; it is also the only one that is quite straight; the lateral folds, numbering about seven on each side are more or less arched according to the position they occupy, and the thickness diminishes in proportion to their distance from the mesial fold. The dorsal valve is almost as deep as the opposite one, and slightly sinuated in the median portion; it has the same ornamentation as the last-mentioned, and the anterior margin is a little prolonged, so as to make the margin at the front sinuous.

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[1] Davidson, Sil. Brach., pl. 46, fig. 11.

[2] J. Hall, Pal. N. York, ii, pl. 31, fig. 2.

[3] [*Vide* R. Etheridge, Junr., Records Geol. Survey N. S. Wales, 1892, iii, Pt. 2, p. 59.—W.S.D.]

Dimensions.—Length, six millimetres; width, seven millimetres; thickness, five millimetres.

Relations and Differences.—This species is distinguished from all Devonian congeners, by its small size, and the shape and number of its folds.

Horizon and Locality.—A single specimen rather well preserved on account of the shell being silicified has been found in a compact black limestone from the Yass District. It is associated with a fragment of a *Spirifer* related to *Spirifer Paillettei*, de Verneuil.

Genus—RHYNCHONELLA, *Fisher de Waldheinn.*

1. Rhynchonella pleurodon, *Phillips.*

Terebratula pleurodon, J. Phillips, 1836, Geol. Yorkshire, II, p. 222, pl. 12, fig. 25–30 (fig. 16, *excl.*)
„ „ *Idem,* 1841, Pal. Foss. Cornwall, &c., p. 86, pl. 35, fig. 155.
Atrypa multidens, A. d'Orbigny, 1850, Prodr. Pal., I, p. 94.
Rhynchonella pleurodon, J. Morris, 1854, Cat. Brit. Foss., p. 147.
„ „ T. Davidson, 1865, Mon. Brit. Dev. Brach., p. 62, pl. 13, figs. 12, 13.
„ (*Stenocisma*) *Tethys?* J. Hall, 1867, Pal. N. York, IV, p. 335, pl. 54, fig. 1–8.
„ „ *Sappho?* *Idem,* 1867, *ibid.,* p. 340, pl. 54, fig. 33–43.
„ „ *dotis*? *Idem,* 1867, Pal. N. York, IV, p. 344, pl. 54, fig. 11–20.
„ *pleurodon.* L. G. de Koninck, 1873, Recherches Anim. Foss., II, p. 50, pl. 2, fig. 15.

Shell of medium size, usually transverse, oval in shape, valves more or less gibbous, with a rather variable number of radiating angular folds, having their origin at the beaks; these folds are separated from one another through a great part of their extent by rather deep furrows, of which the bottom is also angular; the mesial folds are almost straight, while the lateral are more or less arched according to the position they occupy. The beak of the ventral valve is small, slightly curved and little prominent, but pointed; the sinus is usually rather large and generally composed of four mesial folds separated from the lateral folds by a rib which is much more developed than the adjacent ones; in adult individuals this sinus rises sharply towards the front at about the middle point of its length. The dorsal valve is fairly regularly arched, the median lobe is not always very strongly marked; the number of folds that partake in the formation of this lobe is always greater by one than that comprised in the sinus.

Relations and Differences.—After comparing a large number of Devonian with Carboniferous specimens of this form, I have not been able to find a sufficiently appreciable and constant difference between them to enable me to assert that they belong to different species, as has been stated by A. d'Orbigny; as regards proof to the contrary, I side with J. Phillips and Mr. T. Davidson who consider them both identical. In making this statement, it must be admitted also that the Devonian species vary in their shape as much as do the Carboniferous; at the same time it was difficult for me to believe that *R. Tethys, Sappho* and *Dotis*, J. Hall, are anything but varieties of *R. pleurodon.* However, I do not wish to speak definitely on this point as I am absolutely without material for comparisons.

Horizon and Localities.—In Belgium this species is found in the Upper Devonian and in the United States in the Chemung Group. In Australia it is associated with *Sp. disjunctus*, Sow., in a yellow sandstone at Sofala; it is very abundant in a greyish sandstone at Mount Lambie, near Yass.[1]

2. RHYNCHONELLA PUGNUS? *Martin.*

Conchyliolithes Anomites pugnus? Martin, 1809, Petrif. Derb., p. 13, pl. 22, fig. 4, 5.
Atrypa pugnus, Sowerby, 1840, Trans. Geol. Soc. Lond., V (2), pl. 56, fig. 15–18.
Terebratula „ J. Phillips, 1841, Pal. Foss. Cornwall, p. 87, pl. 35, fig. 156.
„ *anisodonta.* *Idem*, 1841, *ibid.*, p. 85, pl. 34, fig. 154.
Rhynchonella pugnus. T. Davidson, 1865, Mon. Brit. Dev. Brach., p. 63, pl. 12, fig. 12–14, and pl. 13, fig. 8–10.

The shape and characters of this species are sufficiently well known to enable me to dispense with repeating them here. I will confine myself to observing that Mr. Davidson considers it liable to ready modification according to the conditions under which it developed, and also to assume a large number of variations. The facility of alteration does not allow one to decide whether the Carboniferous forms related to Devonian forms are specifically different, as some authors claim, or whether they constitute a persistent group dating from the time of the Middle Devonian.

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[1] [Mt. Lambie is near Rydal on the Western Railway Line, whereas Yass is on the Southern.—W.S.D.]

Horizon and Localities.—I have found only some badly preserved specimens of this species in a compact black limestone from Yarradong, associated with some number of *Orthis interlineata*, Sowerby. In England it is not uncommon in the Devonian limestone of Woolborough, Barton, and Lummaton near Torquay, and in Belgium in the *Receptaculites Neptuni* shale from the neighbourhood of Chimay.

Genus—ATRYPA, *Dalman.*

1. Atrypa reticularis, *Linnæus.*

Anomia reticularis, Linnæus, 1767, Syst. Nat., Ed XII. p. 113.
Atrypa „ T. Davidson, 1865, Mon. Brit. Dev. Brach., p. 53, pl. 10, fig. 3 and 4.[1]
„ „ J. Hall, 1867, Pal. N. York, IV, p. 106, pl. 51–53.

It appears to me useless to delay long over the synonymy and characters of this form so well known to Palæontologists and so widespread through the different beds of the Devonian and the upper beds of the Silurian. I will confine myself to remarking that among the specimens that have been submitted to me, several had the spires well preserved and quite similar to those of European specimens. Others are provided with the marginal expansions, some of them having an expanse of a centimetre. I may add that two of the specimens have the principal characters of *Atrypa prisca*, Schlotheim, considered by my learned friend, Mr. Davidson, with whom I agree, as being only a fairly constant variety of *A. reticularis.*

Dimensions.—The Australian specimens are usually of medium size. I have not met with any that in this respect can be compared to the gigantic individuals that are not uncommon in the Eifel and in the Districts of Chimay and of Couvin.

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[1] A complete synonymy of this species will be found in the works of Messrs, Davidson and Hall.

Horizon and Localities.—With the exception of one from Kempsey all the individuals of this species have been found in the Yass District, on the banks of the Murrumbidgee. The majority occur in a dark grey compact limestone; one is in a rather hard yellowish sandstone, of which the surface, on being oxidised by the air becomes covered with a thin layer of oxide of iron which colours it red. I am led to believe that all these belong to the Devonian.

2. ATRYPA DESQUAMATA, *Sowerby.*

Atrypa desquamata, Sowerby, 1840, Trans. Geol. Soc. London, V (2), pl. 66, figs. 19, 20.

„ „ var. *campana.* *Idem,* 1840, *ibid.*, pl. 56, figs. 21, 22.

Spirigerina desquamata, McCoy, 1852, Brit. Pal. Foss., p. 378.

Atrypa „ T. Davidson, 1865, Mon. Brit. Dev. Brach., p. 58, pl. 10, figs. 9–13, and pl. 11, figs. 1–9.

The characters of this *Atrypa* are so similar to those of *Atrypa reticularis,* that it is often very hard to distinguish the shells belonging to the one from those referred to the other. My learned friend, Mr. Davidson, also expressed his doubts that *A. desquamata* is anything but a variety of *A. reticularis.* He observes that the chief differences between the two forms consists in that the first has a well-marked area and very noticeable foramen, while this foramen is usually hidden in the second by the strong curvature of the beak; it is otherwise less globose, and the growth lamellæ are smaller and less well marked. But these are not in this case very salient characters that may not be easily modified in accordance with the conditions under which the animal has lived.

3. ATRYPA PLICATELLA, *L. G. de Koninck.*

Pl. III., fig. 4.

Shell oval in shape, elongate, rather small. Dorsal valve fairly regularly arched, without any apparent fold; surface ornamented with eleven or thirteen radiating ribs, rounded, separated from one another by furrows of the same width as the folds, of which the median is a little more prominent than the others and plays the part of a fold. Ventral valve a little less convex than the opposite valve, slightly sinuated in the median portion;

sinus occupied by three adjacent ribs, of which the two lateral are a little less prominent than the middle one. The surface is covered with ribs similar to those of the dorsal valve, twelve or fourteen in number.

The beak, as far as it has been possible for me to free it from the matrix, appeared small. The margins of the two valves show at the front a well-marked sinuosity.

Dimensions.—Length, twelve millimetres; width, nine millimetres; thickness, four millimetres.

Relations and Differences.—This species has much resemblance to *Atrypa prominula*, Roemer, of which it has almost the same outline; it differs from it in its small size, in the less convex form of the valves, in the greater sinuosity of the frontal line, and in the number of ribs which in the maximum is but fourteen, while in the species from the Eifel it is twenty. It differs from *A. Adrienni*, de Verneuil, in the more elongate form and small number of ribs as well as in the sinuosity of the frontal line.

Horizon and Locality.—A very small number of individuals of this species has been collected in a black limestone from the Yass District.

Genus—SPIRIFER, *Sowerby*.

1. SPIRIFER DISJUNCTUS, *Sowerby*.[1]

Spirifera disjuncta, Sowerby, 1840, Trans. Geol. Soc. London, V (2), pl. 53, fig. 8, and pl. 54, figs. 12, 13.
,, *calcarata*, *Idem*, 1840, *ibid.*, pl. 55, fig. 7.
,, *extensa*, *Idem*, 1840, *ibid.*, pl. 54, fig. 11.
,, *gigantea*, *Idem*, 1840, *ibid.*, pl. 55, fig. 1–4.
Spirifer Verneulii, Murchison, 1840, Bull. Soc. Géol. France, IX (1), p. 252, pl. 2, fig. 3.
,, *Archiaci*, *Idem*, 1840, *ibid.*, pl. 2, fig. 4.
,, *Lonsdalii*, *Idem*, 1840, *ibid.*, pl. 2, fig. 2.
Spirifera disjuncta, J. Phillips, 1841, Pal. Foss. Cornwall, etc., p. 74, pl. 29, fig. 128, *f*, *g*, *h*; fig. 129, and pl. 30, fig. 129.
,, *protensa*, *Idem*, 1841, *ibid.*, p. 69, pl. 28, fig. 118.

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[1] [Vide, R. Etheridge, Junr., Journ. P. Soc. N. S. Wales for 1880 [1881], XIV, p. 255, pl., fig. 5.—*Spirifera disjuncta*.—W.S.D.]

Spirifer Murchisonianus, L. G. de Koninck, 1843, Précis Élém. Geol. par d'Omalius d'Halloy, p. 523.

" " De Verneuil, 1845, Russia and the Ural Mts., II, p. 160, pl. 4, fig. 1.

" *disjunctus*, *Idem*, 1845, *ibid.*, p. 157, pl. 4, fig. 4.

" *Archiaci*, *Idem*, 1845, *ibid.*, p. 155, pl. 4, fig. 6.

" *Barumensis*, Sowerby, M S., 1863, Salter, Quart. Journ. Geol. Soc., XIX, p. 480.

Spirifera disjuncta, T. Davidson, 1865, Mon. Brit. Dev. Brach., p. 23, pl. 5, figs. 1–12, and pl. 6, figs. 1–5.

" " J. Hall, 1867, Pal. N. York, IV, p. 243, pl. 41, 42, and pl. 63, fig. 14.

The shell of this species is very subject to variation; although it usually is broader than long, it sometimes happens that the contrary obtains, and then it assumes the shape to which thirty years ago I gave the name *S. Murchisonianus*. In all cases the valves are convex, sometimes even gibbous and almost of equal depth. The beak of the ventral valve is usually prominent, little incurved; area more or less elevated, concave, and hollowed; fissure triangular, partially covered by a pseudo-deltidium made up of two plates; sinus rather deep and clearly marked off. The mesial fold of the dorsal valve is raised in proportion to the depth of the sinus of the other valve and separated from the rest of the shell by two furrows a little better marked than those that separate the other surface ribs. Each of the valves is ornamented on either side by twenty to forty ribs, simple, rounded, and radiating, the thickness of which decreases in proportion to their distance from the sinus or the mesial fold; the ribs in the two last-mentioned regions are thinner than those of the lateral portions; their number increased by bifurcation, or by the insertion of a new fold, at variable distances from the beaks. In well preserved individuals the ribs are crossed by small concentric growth striæ.

The shell of the ventral valve is usually thicker than that of the dorsal; the muscular impressions in it are rather deeply excavated, while those of the other valve are almost superficial.

Dimensions.—Very variable; some varieties may attain a width of about ten centimetres, by a length of three to four centimetres. The average width of Australian specimens is three and a half centimetres by a length of two centimetres.

Observation.—It is a long time since I expressed the opinion that the *Spiriferæ*, the names of which are mentioned in the synonymy, are in reality but varieties of one and the same species, and I am pleased to see that Messrs. Davidson and J. Hall look at it in the same way and make the same remarks. In fact, I do not know a single really constant character which sanctions the separation of *Spirifer Archiaci*, and *Lonsdalei*, Murchison, and *Spirifer calcaratus*, Sowerby, from the true *S. disjunctus* or *Verneuilii*. In bringing together a large number of specimens of this species, one passes insensibly and by gradual transition from the elongate *Spirifer Murchisonianus* with rounded sides, to the broad *Spirifer calcaratus* with very extended and very acute lateral extremities.

Horizon and Localities.—This species is very abundant in the Upper Devonian Formation in the *Calceola sandalina* and *Strigocephalus Burtini* beds, and may be used to characterise them.

It is found at a great number of localities in Belgium, Germany, England, Ireland, France, Russia, the United States, and even in China. In New South Wales internal casts of this species fill, almost exclusively, a very hard, siliceous white sandstone at Bowenfels,[1] another, yellowish and softer, at Sofala, and a third, brownish red, at Colocolo. At Collin's Flat, near Bungonia, this *Spirifer* occurs in a greyish very compact magnesian limestone.

2. SPIRIFER MULTIPLICATUS, *L. G. de Koninck.*

Pl. III, fig. 5.

Shell broad, greatest width at the hinge line; valves moderately arched; the mesial fold of the dorsal valve, which is the only one well known, is little raised, angular in the middle and separated from the lateral regions by a rib, one of the sides of which is more developed than the other; its surface is ornamented with several other ribs that appear to be thinner than those on the surface of the lateral parts; these last, fifteen on each side, are peculiar in their regularity and in the depth of the furrows that separate them from one another. In examining them with a lens, it will be seen that they are traversed by delicate growth striæ producing very thin and short imbricating lamellæ. The cardinal slopes form a very acute angle with the lateral slopes. The area, of which I have been able to see a small portion, appeared to me to be well developed, which makes me think that the beak is rather prominent. The exterior ornamentation of the ventral valve is similar to that of the dorsal.

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[1] [Mt. Lambie.—W.S.D.]

Dimensions.—Width, thirty-five millimetres; length, about fifteen millimetres; thickness, twelve to fourteen millimetres.

Relations and Differences.—In its general form this species resembles certain varieties of *Sp. disjunctus*, Sowerby; but it is distinguished from it rather easily by the relatively lesser thickness in proportion to the width; in the smaller number of the radiating folds and the greater depth of the furrows that separate them from one another, and above all by the very marked difference of structure that may be seen in the two lateral folds of the mesial fold and consequently also of the sinus, when they are compared with the folds that ornament the rest of the surface. In *Spirifer disjunctus* this last character is almost entirely wanting. It should be decided whether, on this point, *Spirifer calcaratus*, G. Sandberger,[*] which seems to me different from the species figured under the same name by Mr. Sowerby, is developed to the same extent as this. At the present time I have not the necessary material to settle this question.

Horizon and Localities.—A single rather badly preserved specimen has been collected in a grey, very compact limestone in the Yass District.

3. SPIRIFER CABEDANUS, *de Verneuil.*

Spirifer cabedanus, De Verneuil, 1845, Bull. Soc. Géol. France, II (2), p. 473, pl. 15, fig. 3.

Shell subglobose and a little broad, greatest breadth at the hinge line. Ventral valve regularly curved, deeper than the opposite one. Beak inflated, prominent, incurved and pointed at the apex; area triangular, rather high, with an open deltidium; cardinal slopes forming an angle a little less than a right angle with the lateral; sinus deep, provided with a very marked median fold which starts at the end of the beak.

On either side of the sinus can be counted twelve radiating ribs, rounded, of variable thickness and also thinner as they occur farther from the sinus; they are separated by deep furrows of the same width as the adjacent ribs. Dorsal valve semi-circular in form, beak very small, agreeing with the median fold of the sinus of the opposite valve; lateral folds similar to those of the other valve. Growth lines giving rise to the formation of small imbricating lamellæ may be seen, principally on the sides, on good specimens.

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[*] Vide Die Versteinerungen des Rheinischen Schichten Systems im Nassau. pl. 31, figs. 10, 11.

Dimensions.—Length, twenty-three millimetres; width, thirty-four millimetres; thickness, eighteen millimetres.

Horizon and Localities.—I have not been able to find any tangible difference between the Spanish specimens of this species from the limestone of Feronès and that which has been collected by Mr. Clarke in a black limestone from the Yass District. It is probable that both belong to the same geological epoch, that is the Middle Devonian.

4. SPIRIFER YASSENSIS, *W. B. Clarke.*

Pl. III, Fig. 6.

Shell subglobose, almost as broad as long. Ventral valve regularly curved on itself; twice as deep as the opposite valve; beak fairly strongly curved on itself and pointed; area rather higher, hollowed like a gutter, ends slightly rounded; sinus deep, very wide in proportion to the size of the shell, and angular at the base. Dorsal valve provided with a prominent fold corresponding to the sinus of the opposite valve; surface of the two valves ornamented on either side by fourteen or fifteen radiating ribs, of which the last are very small and sometimes strongly separated by furrows of the same width as the adjoining ribs. On good specimens several lines of growth may be seen towards the borders.

Dimensions.—A very well-preserved specimen gave the following measurements:—Length, nineteen millimetres; width, twenty millimetres; thickness, fifteen millimetres; width of the sinus, seven millimetres.

Relations and Differences.—It is only after great hesitation, minute examination, and numerous comparisons that I have decided to separate this species from *Spirifer hystericus*, Schlotheim, *subspeciosus* and *Glîncanus*, de Verneuil, to which it has the greatest resemblance. It differs from the first two in its less broad shape and in the number and less thickness of the ribs as well as in the stronger curvature of the beak. One can still less confuse it with the last mentioned, whose greatest width is towards the middle, and in which the very flattened folds are twice as wide as the furrows that separate them.

Horizon and Localities.—This species has been sent to me by Mr. Clarke under the name in which I have just described it, and was collected by him in a compact blackish limestone from the Yass District; also at Duntroon, in a yellow-brown argillaceous limestone, softer than the first, in which it is more common.

5. SPIRIFER LATISINUATUS, *L. G. de Koninck.*

Pl. III, Fig. 7.

Spirifer curvatus, var. undulata ? C. F. Roemer, 1844, Das Rhein. Uebergangsgebirge, p. 70, Pl. 4, Fig. 5, *non* Schl.

Shell gibbous, broad, widest at the hinge line. Ventral valve provided with a broad sinus that occupies at the margin almost half the valve, rather deep and hollowed in the form of a canal with a rounded bottom. The beak, which I know but imperfectly, appears to be well developed and a little curved on itself; the area is rather high and triangular. The dorsal valve is sub-semi-circular, slightly sinuated in the frontal portion, and provided with an obtuse rather prominent fold. The sides of each of the valves are ornamented with seven or eight radiating ribs of an almost equal thickness, and which are only separated from one another by very slightly marked furrows. The well-preserved portions of the shell are covered, principally towards the margins, with fine concentric lamellæ.

Dimensions.—Length, twenty-two millimetres; breadth, thirty millimetres; thickness, eighteen millimetres; width of the sinus, fourteen millimetres.

Relations and Differences.—I am strongly of opinion that the *Spirifer* I have just described is identical with that which Mr. Ferd. Roemer has figured under the name *Sp. curvatus,* Schlotheim, but which has no analogy to that species. It resembles more, in the form of the folds, *S. cabanillas,* de Verneuil, from which, however, it may be easily separated by its broad shape, while that of the Spanish form is elongate and almost oval.

Horizon and Localities.—*Spirifer latisinuatus* is found on the banks of the Murrumbidgee, in the Yass District, in a blackish, very compact limestone, and also in the Middle Devonian limestone of Gerolstein in the Eifel.

6. SPIRIFER NUDUS, *Sowerby*.

Spirifera nuda, Sowerby, 1840, Trans. Geol. Soc. London, V (2), pl. 57, fig. 8.

„ *pulchella*, *Idem*, 1840, *ibid.*, pl. 57, fig. 9.

„ *nuda*, J. Phillips, 1841, Pal. Foss. Cornwall, p. 78, pl. 31, fig. 138.

Spirifer nudus, Ferd. Roemer, 1855, Dunker's Palæontographica, V, pl. 4, fig. 20.

Spirifera nuda, T. Davidson, 1865, Mon. Brit. Dev. Brach., p. 38, pl. 4, fig. 17–22.

Shell small, sub-oval, a little broader than long, greatest width about the middle of its length. Ventral valve convex, deeper than the opposite one; beak small, incurved, rather prominent. Area a very pronounced triangular shape, with the fissure partly closed by a pseudo-deltidium; sinus rather deep and relatively broad, rising at the apex of the beak; one or two strong ribs are on each side of the sinus. The dorsal valve is less convex than the ventral, and is provided with a rather prominent fold and one or two lateral ribs, corresponding to those that have just been mentioned.

Dimensions.—Length, five millimetres; width, six and a half millimetres; thickness, three millimetres.

Observation.—The preceding description and dimensions are quite applicable to the only specimen of the species I have before me; but Mr. Davidson rightly remarks that this species is very variable as regards the extent of its area, and the number of lateral ribs with which the surface is provided, and which may be altogether wanting in some specimens.

Horizon and Localities.—Sowerby was the first to record the occurrence of this species in the Middle Devonian limestone of Dockyard, near Plymouth. After him, it was discovered in several other localities in Devonshire. Mr. Clarke has collected it in a black limestone containing *Atrypa plicatella*, L. G. de Koninck, in the Yass District.

Division—MOLLUSCA.

Class—LAMELLIBRANCHIATA.

Genus—PARACYCLAS, *J. Hall.*

Although it is rather difficult to define this genus satisfactorily, in consequence of the impossibility of procuring the perfect hinges of the shells upon which it has been founded, I have no doubt that one may succeed in freely grouping under it different species that belong to it, and which, up to the present, have been classed, some under *Lucina*, some under *Pullastra*, some under *Ungulina* and even under *Posidomya*; in fact, there may be united under it a number of Palæozoic bivalves without external ligament or lunule, orbicular or slightly ovate in form, little convex, with the valves quite closed, rather sharp, with small sub-central beaks little incurved, and the surface usually ornamented with more or less marked concentric lines of growth. The internal structure is very similar to that of *Lucina*. The casts being provided with a strong groove on the cardinal margin, demonstrate that the hinge must have attained a rather large size.

Relations and Differences.—The species of this genus have a great likeness to *Lucina*, from which they are distinguished chiefly by the entire absence of external ligament and lunule.

Horizon.—All the species that I think should be referred to the genus *Paracyclas*, belong either to the Devonian or to the Carboniferous. These are *Paracyclas* (*Lucina*) *proavia*, Goldfuss, which I take as type; *Dufrenoyi*, d'Archiac and de Verneuil; *ohioensis*, Meek, *antiqua* and *lineata*, Goldfuss; *Paracyclas* (*Pullastra*) *elliptica*, Phillips and *P.* (*Venulites*) *concentrica*, F. Roemer, that are Devonian; and *Paracyclas coyana*, A. d'Orbigny (*Lucina antiqua*, McCoy, *non* Goldfuss) and *hibernicensis*, A. d'Orbigny (*Ungulina antiqua*, McCoy) that are Carboniferous.

PARACYCLAS ELLIPTICA, *J. Phillips.*

Pullastra elliptica, J. Phillips, 1840, Pal. Foss. Cornwall, p. 35, pl. 17, fig. 54.
Cardinia „ A. d'Orbigny, 1850, Prodr. Pal., I, p. 76.
Pullastra „ J. Morris, 1854, Cat. Brit. Foss., p. 222.

Shell inequilateral, subelliptic, valves fairly regularly, though slightly, arched in the median portions, and depressed towards the cardinal and anterior borders, which are rather sharp. The beaks, very small, are contiguous and curved posteriorly. The entire surface is covered with concentric lines of growth, the depth of which, although slight, is rather variable in the space that separates them from one another, and thus produces a design but little regular.

Dimensions.—Length, fourteen millimetres; width, sixteen millimetres; thickness, six millimetres.

Horizon and Localities.—Professor Phillips discovered this pretty species at South Petherwin in Cornwall; Mr. Clarke has collected it from a compact blackish limestone on the banks of the Murrumbidgee, in the Yass District.

Genus—CONOCARDIUM, *Bronn.*

CONOCARDIUM SOWERBYI, *L. G. de Koninck.*

Cardium aliforme (var.) Sowerby, 1840, Trans. Geol. Soc. London, V (2), pl. 56, fig. 2.

Pleurorhynchus aliforme, J. Phillips, 1840, Pal. Foss. Cornwall, p. 34, pl. 17, fig. 51.

Shell sub-triangular in outline, gibbous, truncate and bounded anteriorly by a strongly-marked curved carina; the anterior surface is heart shaped, slightly convex and extending almost to the ventral margin at its lower extremity; this surface is ornamented with a large number of small concentric ribs, which, contrary to those occurring in most other species and particularly in those of the type of *Conocardium aliforme*, have their origin near the beaks and are parallel to the ribs of the remainder of the surface, as has been very clearly stated by Professor J. Phillips. These are fairly regular and almost all of the same thickness; the last only—that is to say, those that cover the posterior and gently-gaping portion of the shell—are a little less thick and a little more flat than the others. Between these ribs, which are about twenty in number, the cellular structure of the shell may be easily seen. The probosciform anterior tube appears to be very short and sub-conical.

Dimensions.—Length, thirteen millimetres; width, fifteen millimetres; thickness, eleven millimetres.*

Relations and Differences.—Several Palæontologists have confused this species with *Conocardium aliforme*, Sowerby, which is an exclusively Carboniferous species, and which is distinguished from it easily by several characters, the most striking of which are—(1) the difference of the width, which is, proportionally to the length, much greater in the Carboniferous species; (2) the less regular shape and greater number of ribs ornamenting the ventral and posterior surface of the valves of the last-mentioned species; and (3) the shortness and conical nature of the anterior tube and the lesser development of the heart-shaped portion from which it originates, in the Devonian species.

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* I call "length" the distance between the end of the beaks and the most prominent portion of the ventral margin; by width, I mean the antero-posterior diameter; and by thickness, the line that joins the two highest points of the two valves, considered as in position and viewed in profile.

Observations.—The majority of Authors have considered the portion of *Conocardium* that is truncate and provided with a tubular prolongation as constituting the anterior portion of these shells. Dr. S. P. Woodward was the first to express a contrary opinion, an opinion that has found a new defender in the person of Mr. R. Etheridge, junior. In spite of the respect I have for the works of these savants, and the regard I have for them, I cannot agree with their opinion. As I expect soon to have a more favourable opportunity than this to elaborate the reasons that compel me to differ from them, I will confine myself to remarking that usually the anterior portion of the shells of Lamellibranchs is less developed than the opposite portion; that the beaks are directed towards this portion, more rarely gaping and more often truncate; that whilst the surface is ornamented with ribs or radiating folds, yet the ornaments are broader and thicker on the posterior side of the shell, as is readily seen in the Cardiadæ, and particularly in *Lithocardium aviculare,* Lamarck, *Cardium hemicardium,* Linnæus, *Adacna edentulum,* Pallas, etc., and finally, develops and is prolonged more towards the posterior than the anterior end. As all these characters obtain in *Conocardium,* it will be easy to draw from them the conclusions to which I have myself arrived.

Horizon and Localities.—Sowerby and J. Phillips have recorded the presence of this species in the Devonian of Stonehouse Hill, and Barton. Mr. Clarke has sent me two specimens discovered in the black argillaceous limestone of the Yass District.

Genus—TELLINOMYA, *J. Hall.*

TELLINOMYA CLARKEI, *L. G. de Koninck.*

Pl. III, Fig. 8.

Shell of moderate size, broad, sub-ovate, fairly regularly arched; beak small, little inclined; posterior end shorter and with a more regularly semi-circular outline than the anterior, the contour of which is almost elliptical. Surface completely covered by a large number of fine concentric ridges, a little thinner towards the summits of the shell than towards the margins, where they are parallel. They are separated from one another by narrow but pretty well-marked furrows; their surface is rugose. The hinge is composed of ten posterior teeth, the last five of which are much more developed than the first, and about twenty anterior teeth, of which those farthest distant from the beaks are also a little stronger than the others. No interruption can be seen in the dental series, and one cannot see in it the least trace of a ligament pit, which constitutes one of the chief characters of the genus to which the species belongs. The ventral border is sharp and smooth.

Dimensions.—Length, eleven millimetres; width, eighteen millimetres; thickness, seven and a half millimetres.

Relations and Differences.—This species has some resemblance to *T.* (*Pullastra?*) *antiqua,* Sowerby, which it resembles most in the surface ornamentation. It may, however, be easily distinguished from it by its more oval form and the greater number of concentric ridges with which the surface is covered, and by its relatively greater thickness.

Horizon and Localities.—A single well-preserved specimen of this species has been discovered in the blackish argillaceous limestone of the Yass District.

Genus—AVICULOPECTEN, *McCoy.*

1. Aviculopecten Etheridgei, *L. G. de Koninck.*

Pl. III, Fig. 9.

I am acquainted with the left valve only of this pretty species. With the exception of the ears, it is almost regularly circular, and almost as long as broad; it is fairly uniformly but very slightly arched; the test is very thin; the surface is ornamented with about forty very narrow radiating ribs, the width of which is little different from one end to the other; they all have their origin in the beak and undergo no bifurcation; the distance apart has no regularity; the remaining ribless part is flat and almost smooth, some slight concentric undulations only produced by the successive growth of the shell is all that can be seen. The anterior ear is subtriangular and separated from the rest of the valve by a well-marked furrow; the ligamental margin is perpendicular to the principal axis of the shell; the surface is ornamented with three or four small radiating ridges, of which the principal helps to form the furrow I have just mentioned; sinuous striæ, parallel to the lateral border and formed by the periodic growth, cross these ridges obliquely. The posterior ear seems to have a slightly greater extent than the anterior, and is separated from the rest of the valve only by a feeble oblique depression; its surface is ornamented with small, rather close, curved striæ.

Relations and Differences.—I know no Devonian species that can be confused with that I have just described. In its ornamentation it resembles *A. leiotis* and *micropterus*, McCoy, which are Carboniferous species, but which differ from it in size and general shape.

Dimensions.—Length, about four centimetres; width, forty-three millimetres.

Horizon and Localities.—This pretty species, which I have dedicated to Mr. R. Etheridge, whose work on the fossils of Queensland I have already had occasion to mention, has been collected by Mr. Clarke in the black argillaceous limestone of the Yass District. Its shell is silicified, as is the case in most of the other species occurring at the same locality.

2. AVICULOPECTEN CLARKEI, *L. G. de Koninck.*

Pl. III, Fig. 10.

As in the preceding species, I am acquainted with only one valve of this shell—that is, the left—which is of moderate size, a little longer than broad, and the beak is rather pointed, its angle measuring only 85°. The ventral margin is fairly uniformly rounded and blends with the lateral margins by a regular curve. The surface is ornamented with ten to twelve radiating ridges about a millimetre thick towards the margin, and interrupted here and there by slight inflations that appear to me to have been the base of imbricating lamellæ. At some distance from the apex sharp thinner ridges arise by intercalation between the primary and like those continue towards the margin. The ears, which probably were rather small, are quite unknown to me.

Dimensions.—Length, twenty-two millimetres; width, twenty millimetres.

Relations and Differences.—In the ornamentation that covers its surface, its size, and general form, this species has much resemblance to

Aviculopecten ovatus, McCoy, from which, however, it is easily distinguished by the number of radiating ridges, which is much greater on the Carboniferous species than on this one.

Horizon and Locality.—A single specimen has been found at Kempsey in a reddish phtanite, associated with a fragment of another species of the same genus and *Atrypa reticularis,* Linnæus.

3. AVICULOPECTEN M'LEAYI, *L. G. de Koninck.*

Pl. III, Fig. 11.

Though I am acquainted with this species from a fragment of the left valve only, still this fragment is sufficient to allow me to assert, without the least hesitation, that it is different from all those that have been hitherto described. It is the anterior portion of the valve, provided with its ear, that is the best preserved; the middle portion has been fractured, is indistinct, and the posterior portion has completely disappeared.

The following are the characters I have been able to ascertain, and which will serve to enable one to recognise the species when better specimens may have been discovered.

The shape is probably suborbicular, perhaps a little oval and elongate. The left valve is rather deep and regularly arched outwards; the surface is ornamented with twenty to thirty radiating, fairly thick, plain, rounded ridges of a diameter practically the same throughout the median portion of the valve; the five or six ridges closest to the anterior margin are less regular, a little thinner than the others, and some even are bifurcated; all these ridges are traversed concentrically by numerous fine imbricating lamellæ, formed by the successive and slightly irregular growth of the shell. The ear is large and rounded anteriorly; it is furnished with several ridges (five to six) radiating like those of the remainder of the surface, but crossed by stronger lamellæ, thicker and parallel to the margin.

Dimensions.—Length, about seven centimetres; thickness of the left valve, six to seven millimetres.

Relations and Differences.—In its size this species approaches *Aviculopecten Hasbachii*, d'Archiac and du Verneuil, but it is widely separated from it in the form and number of its ridges, and above all by the presence of well-marked growth lamellæ on its outer surface.

Horizon and Locality.—The single fragment I have been able to examine was collected on the banks of the Macleay River; it is in a sandy limestone, grey or brownish in colour. Although I place the species I have just described among the Devonian species, I ought, however, to observe that I have no certain evidence to enable me to affirm positively that it belongs to this Palæozoic epoch. I am guided only by the appearance and the nature of the rock and the presence in the neighbourhood of the same locality, but in a slightly different rock, of *Favosites polymorpha*, Goldfuss. New facts will be necessary to solve definitely the fact I have just stated.

Genus—PTERINEA, *Goldfuss.*

PTERINEA LAMINOSUM, *L. G. de Koninck.*

Pl. III, Fig. 12.

Shell slightly transverse and a little oblique, contour suborbicular; beak small and situated at the anterior third of the cardinal margin; right valve a little, and rather unequally, arched, slightly depressed towards the posterior portion of the ventral margin; the posterior wing fairly developed and triangular and connected to the median portion of the valve along a slightly marked sinuous line; the outer surface is covered by ten rather thin concentric lamellæ, a little irregularly distant from one another and projecting but little. The shell is fairly thick in comparison to the small size of the shell. The left valve, of which I have been able to examine only a small portion, appeared to me to be flat. The hinge is unknown to me.

Dimensions.—Length, ten millimetres; width, twenty-one millimetres; thickness, about five millimetres.

Relations and Differences.—I know no species comparable to this and with which it might be confused.

Horizon and Locality.—A single specimen has been found in the argillaceous limestone of the Yass District.

Class—GASTEROPODA.

Genus—DENTALIUM, *Linnæus.*

1. Dentalium antiquum, *Goldfuss.*

Dentalium antiquum ? Goldfuss, 1844, Petref. Germ., III, p. 2, pl. 168, fig. 2.

Among the specimens that have been entrusted to me by Mr. Clarke I have come across two pieces of blackish limestone, of which the first shows on one surface the marks of a transverse section and the second that of a longitudinal section of *Dentalium*, characterised distinctly by the entire absence of internal septa and siphuncle. As the outline of these sections corresponds exactly with that which Goldfuss has named *Dentalium antiquum*, I am led to believe that the Australian specimens belong to the same species. The existence of a third specimen freer from the matrix strengthens me in this opinion. In fact the surface is covered with transverse lines of growth in all respects similar to those ornamenting the specimens collected in the Eifel.

Dimensions.—Length, fifty-five millimetres; diameter of the anterior opening, six millimetres.

Horizon and Localities.—One of the two specimens examined comes from the Yass District and the other from Yarradong. This last specimen contains, as well as the *Dentalium*, several specimens of *Spirifer Yassensis*, and there is no doubt as to its Devonian age.

2. Dentalium tenuissimum, *L. G. de Koninck.*

Pl. IV, Fig. 3.

Shell in the form of a very elongated cone, straight, almost cylindrical, cross section circular, shell very thin; surface smooth.

Dimensions.—As I know only an incomplete specimen of this species, it is impossible for me to give its exact dimensions. This specimen is thirty-five millimetres long; the diameter of the anterior end is five millimetres, and that of the opposite broken end four millimetres.

Relations and Differences.—In its straight form this species resembles *D. annulatum*, G. Sandberger, and *priscum*, Münster. It is distinguished from the first by the thinness of its shell and by the total absence of ornamentation from its surface, and from the second by its relatively less conical and more elongate shape.

Horizon and Locality.—It is found in the black argillaceous limestone of the Yass District.

Genus—BELLEROPHON, *Montfort.*

BELLEROPHON CONVOLUTUS, *L. G. de Koninck.*

Pl. IV, Fig. 4.

Bellerophon Wenlockensis ? Phillips, 1841, Pal. Foss. Cornwall, p. 108, pl. 40, fig. 203 (*non* Sowerby).

Shell small, composed of five or six spiral whorls, rather close, strongly investing; shell thin and surface smooth. The breadth of the last whorl is almost equal to the total height of the shell. The umbilicus is narrow and deep. Back rounded. Mouth crescent-shaped, broader than high.

Dimensions.—Diameter, five millimetres; width of the mouth, four and a half millimetres; thickness of the last whorl, one and a half millimetres.

Relations and Differences.—This small species, which J. Phillips has with some doubt referred to the young stage of *Bellerophon Wenlockensis*, Sowerby, differs from that species not only in size but also in its less globose shape, and especially in the number and closeness of its spiral whorls.

Horizon and Localities.—In England in the Devonian limestone of Newton-Bushel, and in Australia in the black limestone of Yass.

Genus—MURCHISONIA, *d'Archiac and de Verneuil.*

1. MURCHISONIA VERNEUILIANA, *L. G. de Koninck.*

Murchisonia angulata, D'Archiac and de Verneuil, 1842, Trans. Geol. Soc. London, V (2), p. 356, pl. 32, figs. 6 and 7 (*non R. angulata*, Phillips).

„ *Verneuiliana,* L. G. de Koninck, 1843, Précis élém. Géol., d'Omalius d'Halloy, p. 516.

„ „ *Idem*, 1843, Descr. Anim. Foss. Terr. Carb. Belg., p. 411, pl. 38, fig. 5.

„ *angulata,* Goldfuss, 1844, Petref. Germ., III, p. 26, pl. 172, fig. 5.

Pleurotomaria angulata, G. Sandberger, 1850, Verstein. Rhein. Schichten-Syst. Nassau, p. 204, pl. 24, fig. 19.

Shell elongate, turrited, spiral angle about 38°; it is composed of eight to ten spiral whorls separated by a deep suture and divided into two almost equal parts by two well-marked keels serving as boundaries for the hollow band of the sinus; the sides adjoining this keel, each of which are equally prominent, are hardly arched, and the surface is ornamented with delicate oblique more or less regular lines of growth. The anterior portion of the last whorl of the spire is concave. The columella is simple and slightly sinuated. The mouth is elongate and sub-rhomboidal.

Dimensions.—This species may attain a length of three or four centimetres. The transverse diameter of the last whorl of the spire corresponds to about six-tenths of this dimension [length].

Relations and Differences.—This species has been confounded by d'Archiac and de Verneuil with the one Phillips has described under the name of *Rostellaria angulata,* from which it can easily be distinguished by its spiral angle and double keel, as I have had occasion to point out since 1843. The Devonian species that the learned Professor of Oxford considered identical with the Carboniferous species I have just mentioned, and which he has described and figured under the name of *Murchisonia angulata,*[1] is just as different from the species in question. Indeed, instead of the two keels with which the body whorl of this form is ornamented, that of *M. angulata,* Phillips, has three well-marked ones, as the description and figure testify.

Horizon and Locality.—A single specimen of this species has been found in the black limestone of the Yass District, associated with *Discina alleghania,* J. Hall. In Germany it is rather common in the Middle Devonian limestone of the Pafrath District. In Belgium I have come across it in limestone of the same age at Visé and Nimy, where it is rare.

2. MURCHISONIA TURRIS, *L. G. de Koninck.*

Pl. IV, Fig. 5.

Shell elongated, having the appearance of a cone hollowed in the form of a screw, composed of twelve to fifteen spiral whorls which are angular, and the spiral angle only 13°. The spire is divided into two unequal portions by the band of the sinus, which, as well as being rather narrow, is bounded by two carinæ, the posterior of which is larger, with a more prominent margin than the anterior, and corresponds to the larger portion of the spire; this portion is also a little more convex, but the surface of each is ornamented with slight lines of growth, a little oblique. The aperture of the mouth is sub-semicircular. The columella has no umbilicus.

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[1] Pal. Foss. Cornwall, p. 101, pl. 30, fig. 189.

Dimensions.—Length, about nine millimetres; diameter of the base, twenty-seven millimetres.

Relations and Differences.—This species has several points of resemblance to the preceding, from which it is easily distinguished by its size, spiral angle, and above all by the shape and disposition of the double carina.

Observation.—It is only by the examination of several fragments of the same species that I have been able to grasp the different characters. By chance it happens that these different pieces fit together so well with one another that I feel as confident in dealing with them as if I had a perfect specimen before me.

Horizon and Locality.—All the specimens come from the Yass District.

3. MURCHISONIA GRANIFERA, *L. G. de Koninck.*

Pl. IV, Fig. 6.

Shell very small, elongate, regularly conical, composed of eight spiral whorls, slightly arched, the successive growth of which is very regular. The suture is shown by a well-marked prominence. The spiral angle is 16°. The surface is ornamented with five rows of small granulations parallel to one another, as well as to the suture. The two rows closest to the anterior suture are a little more distinct from one another than those that succeed them; it is between these two rows that the band of the sinus, represented by a small furrow, is situated. The base is faintly depressed. The aperture is oval, and the columella is straight and thickened.

Dimensions.—Length, six millimetres; transverse diameter of the base, two millimetres.

Relations and Differences.—I know no species of the same genus that can be compared to it and with which it could be confused.

Horizon and Locality.—This pretty little species was collected in a greyish argillaceous limestone in the Yass District.

Genus—PLEUROTOMARIA, *Defrance.*

PLEUROTOMARIA SUBCONICA, *L. G. de Koninck.*

Pl. IV, Fig. 7.

Shell small, of conical form, of which the spiral angle is 45°. It is composed of six or seven spiral whorls, angular at their anterior margin, and with a rather deep linear suture. All the whorls of the spire are provided anteriorly with two small parallel carinæ rather close to one another and serving as boundaries for the band of the sinus; the distance separating the anterior carina of this band from the succeeding spiral whorl is equal to that between it and the posterior carina. The base of the shell is slightly convex, while the portion of the first whorls of the spire that is visible is flattened. The surface is ornamented with small rather mingled lines of growth, which have very little regularity. The aperture is sub-rhomboidal. The umbilicus appears to me to be free and very small.

Dimensions.—Length, six millimetres; diameter of the base, three and a half millimetres.

Relations and Differences.—This species has very close analogy to *P. conica*, Phillips, from which it differs only in the lesser degree of the spiral angle, its small size, in the outline and little markedness of the lines of growth.

Horizon and Localities.—A single specimen has been seen in a block of limestone from the Yass District.

Genus—EUOMPHALUS, *Sowerby*.

1. Euomphalus nodulosus, *L. G. de Koninck.*

Pl. I, Fig. 12.

Shell small, sub-lenticular, strongly depressed, composed of six or seven spiral whorls, rapidly assuming a considerable width; these whorls are enclosing and are separated from one another by a faint groove only. The surface is ornamented with a series of small transverse tubercles, sometimes a little sinuous, which are about twenty in number on the body whorl; this being strongly set in a very hard and brittle calcareous rock, it is impossible for me to be sure of the shape of the mouth and of the presence of an umbilicus. The spiral angle is about 150°.

Dimensions.—Transverse diameter of the base, fifteen millimetres.

Relations and Differences.—*Euomphalus tuberculatus*, de Koninck, is in my opinion the species that resembles this one the most; it differs in size, the much more rounded section of the spire, and the shape and prominence of the tubercles.

Horizon and Locality.—A single specimen has been collected in a black compact limestone at Yarradong.

2. EUOMPHALUS BIGSBYI, *L. G. de Koninck.*

Pl. IV, Fig. 8.

Shell of rather large size, spire conical, depressed at base, composed of six or seven spiral whorls, very slightly arched, suture little marked, and carinate externally. The surface is ornamented with numerous oblique lines of growth, leading to the inference of the existence of a rather well-marked sinuosity on the exterior edge of the aperture; this should have been rather large and sub-rhomboidal. The umbilicus is large, and enables one to see the several whorls of which the spire is composed. The spiral angle is about 110°.

Dimensions.—Height, about three; diameter of the base, about six centimetres.[1]

Relations and Differences.—This beautiful species, which I have much pleasure in dedicating to my venerable and learned colleague, Dr. Bigsby, has some resemblance to *Trochus oxystomus*, Roemer, and *Platyschisma applanatum*, G. Sandberger. It is distinguished from them both by a lesser basal depression in consequence of the greater convexity of the anterior part of the body whorl; it differs also from the last-mentioned in the large size of the umbilicus.

Horizon and Locality.—I am acquainted with only two specimens of this species. They both occur in the black argillaceous limestone of the Yass District.

Genus—LOXONEMA, *J. Phillips.*

1. LOXONEMA ANGLICUM, *A. d'Orbigny.*

Pl. IV, Fig. 9.

Loxonema rugifera, J. Phillips, 1841, Pal. Foss. Cornwall, p. 101, pl. 38, fig. 188 (*non idem*, Geol. Yorkshire, II, pl. 14, fig. 24).

„ *anglica*, A. d'Orbigny, 1850, Prodr. Pal., I, p. 62.

Shell conical, very elongate, composed of about twenty spiral whorls, the growth of which is regular and gradual. Spiral angle, 12°. Each whorl of the spire is ornamented with thirteen or fourteen ridges or elongated tubercles, a little arched, commencing at the anterior suture, but only rarely extending to the opposite suture; traversing this there is also a band, smooth, and depressed, particularly on the last whorls. The suture is linear. The surface is smooth. The aperture of the mouth is oval. The slightly-thickened columella is twisted.

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[1] The specimen I had at my disposal was too imperfect to enable me to give exact measurements.

Dimensions.—Length, about eight centimetres; diameter of the base, fifteen millimetres.

Relations and Differences.—This species has the greatest resemblance to *Loxonema rugiferum*, Phillips, and it is not strange that the learned Professor of Oxford has confused this Carboniferous species with the Devonian species now in question. In fact, the one differs essentially from the other only in its relatively more elongate shape and in the smallness of the spiral angle, which is but 12° in the Devonian species, while it is 18° to 20° in the Carboniferous.

Horizon and Locality.—Phillips has seen this species in the Devonian of Brushford, and d'Eichwald in that of Bouregi and Lake Ilmen in Russia. Several specimens of it have been collected by Mr. Clarke in the black limestone of the Yass District.

2. LOXONEMA ANTIQUUM, *Münster*.

Pl. IV, Fig. 10.

Turritella antiqua, Münster, 1840, Beitr. z. Petrefactenkunde, III, p. 88, pl. 15, fig. 17.

Loxonema subulata, F. A. Roemer, 1843, Die Versteinerungen des Harzgebirges, p. 31, pl. 8, fig. 12.

Turritella moniliformis, Goldfuss, 1844, Petref. Germ., III, p. 103, pl. 106, fig. 1.

Holopella subulata, G. Sandberger, 1850, Verstein. Rhein. Schichten-Syst. Nassau, p. 229, pl. 26, fig. 10.

Shell having the shape of a very elongated cone, composed of about twenty spiral whorls, the growth of which is regularly progressive; they are slightly arched, and towards the anterior suture are provided with a small, almost linear ledge, hardly visible to the naked eye. The surface is provided with very fine oblique lines of growth. The aperture is oval, and a little longer than broad. The spiral angle is but 5°.

Dimensions.—Length, about thirty millimetres; diameter of the base, four.

Horizon and Localities.—Count Münster was the first to record this species in the Devonian limestone of Elbersreuth. Since then it has been found by F. A. Roemer in the Devonian beds of Terbach in the Harz, and by G. Sandberger in Nassau. Mr. Clarke has found two specimens of it in the black limestone of the Yass District.

3. LOXONEMA HENNAHII, *Sowerby.*

Terebra Hennahii, Sowerby, 1840, Trans. Geol. Soc. London, V (2), pl. 57, fig. 22.

Loxonema Hennahiana, J. Phillips, 1841, Pal. Foss. Cornwall, etc., p. 99, pl. 38, fig. 184.

Shell small elongate, fusiform, composed of six to seven spiral whorls, but little convex, suture linear. Spiral angle about 30°; surface ornamented with a large number of fine longitudinal ridges, a little sinuous, formed by the successive growth of the shell; the oval aperture is wider than long.

Dimensions.—Length, about ten millimetres; diameter of the base, four millimetres.

Horizon and Localities.—Recorded first by Sowerby in the Devonian beds of the Plymouth District; in the Yass District associated with the preceding species, in black limestone.

4. LOXONEMA DEPERDITUM, *Goldfuss.*

Melania deperdita, Goldfuss, 1844, Petref. Germ., III, p. 119, pl. 197, fig. 12.

Loxonema deperdita, A. d'Orbigny, 1850, Prodr. Pal., I, p. 68.

Shell of rather large size, elongate, conical, composed of a great number of slightly enveloping spiral whorls, little convex, suture oblique, and surface quite smooth. Aperture elongate, oval. Spiral angle, about 20°.

Observation.—The fragment of this species that has been submitted to me is so imperfect that it is impossible to determine characters other than those I have mentioned; but still it agrees with such exactitude with the figure published by Goldfuss, and quoted above, that I do not hesitate to identify it with the species it represents. The only doubt I have is in respect to the genus under which it should be placed. The absence of ornament on its surface makes me believe that it is not impossible that it should be classed with *Macrocheilus.*

Horizon and Locality.—Goldfuss has discovered this species in the Devonian limestone of the Eifel. The specimen collected by Clarke occurs in a yellowish grey, rather friable limestone from the Yass District.

Genus—NISO ? *Risso.*

NISO DARWINII, *L. G. de Koninck.*[1]

Pl. IV, Fig. 11.

Shell of moderate size, conical, elongate, fairly regular, composed of sixteen to twenty slightly convex spiral whorls, surface smooth, suture linear; these whorls are not thick, and not enveloping being connected directly to one another by the bases in proportion to the successive growth of the shell. This base is almost flat anteriorly and angular towards the outer margin. An umbilicus, rather large compared to the transverse diameter of the shell, occupies the entire length of the axis. The aperture is sub-rhomboidal in shape, and furnished with a small anterior canal, making it slightly projecting; the external margin is sharp, non-sinuate. Spiral angle, 30°.

Dimensions.—Length, forty; transverse diameter of the base, twenty; height of the body whorl, eight millimetres.

Relations and Differences.—I hesitated for some time before deciding as to under which genus this species should be placed; but after much searching I have not found any genus the general characters of which agree better with those afforded by the several specimens submitted to me than *Niso.* One of the principal causes of my hesitation was that up to the present no representative of this genus had been recorded from the formations older than the Tertiary. After long and fruitless searches for a Palæozoic species showing some analogy to this form, I have found myself compelled to surrender to the evidence and list under *Niso* a Devonian species, which I have dedicated to my learned contemporary, Mr. Darwin, who was one of the first to explore the coasts of Australia.

Horizon and Locality.—The three specimens I have had at my disposal, one of which shows an almost complete longitudinal section, and which has been very useful to me in the determining of the generic character, have been collected by Mr. Clarke in a black compact limestone in the Yass District.

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[1] [*Vetotuba Dawinii.*—Mr. R. Etheridge, Junr., has proposed a new subgenus—*Vetotuba*—for the reception of this species. Records Austr. Mus., 1890, I, No. 3, p. 63.—W.S.D.]

Genus—MITCHELLIA, *L. G. de Koninck*.[1]

Shell elongate cylindrico-conical, composed of a rather large number of spiral whorls; aperture long and strongly constricted, external margin non-sinuated, doubly arched vertically, thickened and reflected outwards; surface striated in a direction contrary to the axis of the shell.

Observation.—After having tried in vain to place in some already known group the unique specimen that has the characters I have just detailed, I find myself compelled to propose a new genus for the creation of which it has served as the type. I have dedicated this genus to that intrepid traveller, Colonel Mitchell, who was the first to bring to notice a number of Australian Palæozoic fossils. But with the establishing of this genus all the difficulties of classification have not ended, and it remains to work out its affinities with the groups already known. In examining the principal families of the Gasteropoda in which the aperture is elongate and narrow, of which the outer edge of this aperture is not broken, but often folded outwards and thickened, and in which as well the surface is generally ornamented with striæ or furrows parallel to the sutures, it will be concluded, without difficulty, that it is the family Buccinidæ which comprises the greatest number of species showing these different characters. It is, then, in this family, and near the genus *Columbella*, that I propose to class the genus ***Mitchellia***. In the description of the only specimen at present known I will be obliged to repeat a great number of the characters I have mentioned above.

MITCHELLIA STRIATULA, *L. G. de Koninck.*

Pl. IV, Fig. 12.

Shell of moderate size, composed of several spiral whorls, little convex, suture linear, surface ornamented with a large number of fine striæ, well-marked though not deep, and parallel to one another and to the direction of the sutural margin. The body whorl ends in rather narrow aperture, of which the anterior canal and lip are prolonged beyond the base of the shell. The outer margin of the aperture is curved and folded inwards opposite the middle point of the inner margin, which is only faintly bent in the opposite direction, so that the two lips are close together and almost parallel to one another. The outer lip is rather strongly folded outwards, but is smooth and without teeth; the inner lip is thin and without any projection.

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[1] [Fischer classed *Mitchellia* in the Subulitidæ, and was also of opinion that it is closely to Laube's *Euchrysalis*. Manuel de Conchyliologie, 1887, p. 771.—W.S.D.]

Horizon and Locality.—The only specimen of this species found up to the present comes from the Yass District, where it was collected by the Rev. Mr. Clarke in a black argillaceous limestone.

Genus—NATICA, *Lamarck.*

NATICA CIRRIFORMIS, *Sowerby.*

Turbo cirriformis, Sowerby, 1840, Trans. Geol. Soc. London, V (2), pl. 57, fig. 20.

I do not think I am wrong in transferring to the genus *Natica* this small shell, classed by Sowerby as *Turbo*, of which it seems to me it possesses none of the characters. It is subglobose, composed of five to six spiral whorls, of which the last is largely developed, while of the earlier ones only a small portion of the surface is visible. The spire is conical and the spiral angle is about 100°. The whorls of the spire are rather convex, and clearly separated from one another by a well-marked linear suture. The aperture is subsemicircular. The surface is quite smooth.

Dimensions.—Length, ten millimetres; diameter, about eight millimetres.

Relations and Differences.—It is not always very easy to distinguish between the small Palæozoic species of this genus. This one, however, differs from *Natica Ponti*, *antiqua*, and *effosa*, Goldfuss, in the entire absence of the striæ with which the surface of those species is ornamented, and, besides, in the angle and elevation of the spire.

Horizon and Localities.—In England it occurs in the Devonian beds of Plymouth, and in Australia in those of the Yass District.

Class—**CEPHALOPODA.**

Order—**TETRABRANCHIATA.**

Genus—GONIATITES, *de Haan.*

GONIATITES WOODSII, *L. G. de Koninck.*

Pl. IV, Fig. 15.

Shell rather small, slightly compressed laterally, rounded on the back and as seen from the front of ellipsoidal outline. Surface quite smooth. Spire entirely enveloping and leaving no trace of an umbilicus; a small elevation produced by the projection of the last lateral saddle replaces it. Mouth constricted, broader than high, in form a rather narrow crescent. The septa, which with the exception of a small part of the lateral saddles I have not been able to determine, are unknown to me.

Dimensions.—Diameter, thirteen millimetres; thickness, ten millimetres; height of the mouth, six millimetres.

Relations and Differences.—*Goniatites sulcata*, Münster, is of all the the Devonian species I am acquainted with, that which most resembles this form. It differs from it in its more compressed shape and in the definite depression that occurs in the umbilical region.

Horizon and Locality.—This species occurs in an argillaceous and probably schistose rock of brownish colour in the neighbourhood of Yarralumla. I have dedicated it to the Rev. William Woods, Author of a work on Australia.

Genus—CYRTOCERAS, *Goldfuss.*

CYRTOCERAS TEXTILE, *L. G. de Koninck.*

Pl. IV, Fig. 18.

Shell of medium size, horn shaped, slightly bent on itself, section circular. Surface ornamented with eighteen longitudinal ribs, equidistant, angular, though but little projecting, which a large number of transverse lines of growth cutting them at right angles convert into series of small, well-marked denticulations. Septa fairly close to one another and slightly convex. Siphuncle like a string of beads, situated on the dorsal side of the shell, about a quarter of the total diameter of the septa.

Relations and Differences.—In the form of ornamentation it resembles much *C. quindecimale*, Phillips, and *acuticostatum*, G. Sandberger. It differs from the first in the circular form of its septa, from the second in the limited number of longitudinal ridges, and from them both in the bead-like arrangement of the siphuncle.

Horizon and Locality.—It is unfortunate that only one rather imperfect specimen of this pretty species has been found in the black limestone of the Yass District.

Genus—ORTHOCERAS, *Bruguiére.*

ORTHOCERAS SUBDIMIDIATUM, *L. G. de Koninck.*

Pl. IV, Fig. 14.

Shell in shape an elongated cone; the angle formed at the summit by the median and vertical section of this cone is 10°. Septa sub-hemispherical with straight edges; the distance between them is on the average three millimetres in a shell fifteen to twenty millimetres in diameter; the last chamber does not seem to have been large. Siphuncle slender, central, not continuous, forming a small neck in each chamber. Test very thin.

Dimensions.—Length, about thirteen millimetres; diameter of the base, twenty-two millimetres.

Relations and Differences.—This species differs from *O. dimidiatum*, Münster, in its small size and the lesser distance between the septa, as well as in the apical angle which is only 6° in the species described by Count Münster.

Horizon and Locality.—Black argillaceous limestone of the Yass District.

Observations.—Besides the species of *Orthoceras* I have just described, I have come across, among the specimens that have been submitted to me, several fragments of other species of the same genus, of which the state of preservation was too imperfect to enable me to determine them with certainty. One of this species seemed to me to be near *O. lineare,* Münster, and is found in an argillaceous ferruginous conglomerate, composed of a large number of internal and external casts of various fossils; the specimens of the others are rolled and distorted. I would add that although they have been collected in the Yass District, I would not venture to say that they come from the Devonian Formation.

GEOLOGICAL SUMMARY.

The elucidation of the fossils whose descriptions precede this has given me a great deal of trouble, and I have succeeded in determining them only after patient examination and numerous comparisons with European and American specimens, of the determination of which there is not the least doubt. I cannot, however, be certain that, in spite of all my endeavours to arrive at a definite result, some errors may not have crept into the list of species I consider to be Devonian. Though this may have happened, I think I can assert, in all certainty, that the number of these will be so small that it can have no effect on the conclusions that follow, and cannot modify them to the slightest extent.

Of the eighty-one species observed, including a new sponge not described because of the impossibility of determining its genus, as well as a stem of *Rhodocrinus*, there are but five that can be considered, with certainty, as coming from Upper Devonian beds.

These are:—

Strophalosia productoides, Murchison.
Chonetes coronata, Conrad.
Rhynchonella pleurodon, Phillips.
Spirifer disjunctus, Sowerby.
Aviculopecten Clarkei, L. G. de Koninck.

All the others, or at any rate the greater number, and principally those that are found in the black limestone of the Yass District, belong to a geological horizon a little lower than that which has yielded the species I have just quoted, but still more recent than those that are so well characterised by the presence of *Calceola sandalina*, Lamarck, of which I have not seen traces, any more than the Trilobites usually associated with it. Among these eighty-one species thirty are new to science, and are known only in Australia; but it must be noted that, with the exception of four of them, all have their analogues in Europe and America. These four species are:—

Archæocyathus? Clarkei, L. G. de Koninck.
Billingsia alveolaris, ,,
Niso? Darwinii, ,,
Mitchellia striatula, ,,

Two of these, as has been seen, have necessitated the erection of new genera; and it is not impossible that in the future, when better specimens than those submitted to me have been obtained, that it may be decided to propose new genera for the reception of the other two forms.

The first (*Archæocyathus Clarkei*) seems to take in Australia the place occupied in certain Devonian beds in Europe, and more particularly in Belgium, by *Receptaculites Neptuni*, Defrance, which, as well as it, belongs to the order of the Spongida. This is the first time the genus *Niso* has been recorded from Palæozoic formations, and we have to go right up to the Tertiary before again finding traces of it; however, my learned and excellent friend, M. Nyst, without doubt one of the best Conchologists of the day, whom I consulted on the matter, considers he is justified in agreeing with me that there is not sufficient difference between the general characters of the Devonian species and the Tertiary to justify us in not considering them generically identical.

The existence of this genus, together with that of the genus *Mitchellia*, which I would have readily referred to the family Auriculidæ, if it had not been found associated with marine shells, is the only striking anomaly to record in connection with the composition of the Devonian Fauna of Australia, as compared with that of Europe. It is certainly not sufficient to prevent them both being considered as contemporary, and produced under circumstances, if not quite the same, at any rate very analogous.

PART III.

CARBONIFEROUS FOSSILS.

Before applying myself to the examination of the many animal forms belonging to the Carboniferous Period, I will take a passing glance at some of the plant remains of the same period, found at the same time, and often in the same rocks, by the Rev. W. B. Clarke. The number of plant specimens sent me does not exceed twenty, and the greater part of these are in such a bad state of preservation that M. Crépin, who was good enough to examine them, could not determine any with certainty, in spite of his great experience in such work, and in spite of the plentiful materials for comparison at his disposal in the Brussels Museum. He says, however, that some specimens resemble *Lepidodendron veltheimianum*, Sternberg, others *Bornia radiata*, and others *Calamites varians*, Germar; and these three are dominant forms.

Some of these plant remains are found in a hard, compact, yellowish-grey or greenish limestone; others in a greyish or brownish friable sandstone; and some are accompanied by fossils of marine animals, such as stems of Crinoids, *Productus*, *Conularia*, etc.

Their characteristics show that they do not belong to the Coal Flora proper, but to that preceding it, which is preserved in the rocks on which the coal formation rests.

The localities in which these various plant fragments have been found are—the Muree Quarry, Russell's Shaft, Glen William, Burragood, and the Ichthyodorulite Range.

Palæontologists and geologists who have the good fortune to visit these localities may distinguish themselves, and aid in the progress of science, by finding specimens sufficiently well preserved to be satisfactorily identified.

Class—POLYPI.

Order—ZOANTHARIA.

Section—RUGOSA.

Genus—AXOPHYLLUM, *Milne Edwards and J. Haime.*

AXOPHYLLUM ? THOMSONI, *L. G. de Koninck.*

Pl. V, Fig. 3.

Corallum simple, cylindro-conical, slightly curved, enclosed by a thin epitheca, showing faint lines of growth. The calice is sub-circular; columella well defined, laterally compressed, and oval in section. The primary septa number forty-four, they are rather thick in the middle and thin out towards the centre of the calice, and slightly bend back on themselves before reaching the columella. The primary septa alternate with an equal number of secondary septa only one-third as long, of which the greater number, bending themselves slightly towards the primary septa, become united to them by their internal extremities. The interseptal loculi are filled with dissepiments extending inwards from the marginal circumference for about two millimetres. The fossula is not well-developed, and is situated on the concave side of the corallum.

Dimensions.—I have had at my disposal only one very imperfect fragment of this species, the length of which is probably from five to six centimetres. The diameter of the calice is about twenty-three millimetres.

Distinguishing Characteristics.—By its relatively more elongated, more curved, and less turbinated form, and by the union of the secondary with the primary septa, this species may easily be distinguished from all others yet known.

In dedicating it to Mr. James Thomson, of Glasgow, I pay a tribute of respect to the remarkable talent displayed by that gentleman in his examination of the Carboniferous corals of Britain, the study of which was entrusted to him by the British Association for the Advancement of Science, and thank him for his extreme kindness in examining the Australian species mentioned in this work. The chief part of my descriptions of these is derived from notes he kindly transmitted to me.

Formation and Localities.—Two specimens of this species were sent me, one of which came from Jervis Bay and the other from Colocolo.

Genus—LITHOSTROTION, *Lwyd.*

1. Lithostrotion irregulare, *Phillips.*

Pl. V, Fig. 1.

Screw Stone, Robert Plot, 1668, Nat. Hist. Staffordshire, p. 195, pl. 12, fig. 5.

Lithodendron irregulare, J. Phillips, 1836, Geol. Yorkshire, II, p. 202, pl. 2, fig. 14 and 15 (non Michelin).

„ „ Milne Edwards and J. Haime, 1851, Polyp. Foss. Terr. Pal., p. 336.

„ „ L. G. de Koninck, 1872, Nouv. Rech. Anim. Foss. Terr. Carb. Belg., p. 31, pl. 1, fig. 5, and pl. 2, fig. 1.

This coral, of which I gave a minute description in 1872, forms very large arborescent clusters. Its corallites are very long, cylindrical, and slightly flexuous; their diameter is from four to five millimetres. The columella projects slightly, and is a little compressed. The number of septa varies from sixteen to twenty-four, according to the age of the specimen. All these characteristics exist in the Australian specimens before me, and prevent me confounding it with other species of the same genus.

Formation and Localities.—This species is widely distributed throughout the Carboniferous Limestone of England, Ireland, Russia, and Belgium, where M. Ed. Dupont has seen it in many places as a distinct bed from fifteen to twenty centimetres thick, intercalated in the limestone, and serving as a constant horizon in classifying the strata enclosing it. It would be interesting to know if this species affects the same behaviour in Australia, where it is found in a fine-grained, friable, bluish-grey limestone at Port Macquarie, Piper's Creek.

2. Lithostrotion basaltiforme, *W. B. Conybeare and W. Phillips.*

Pl. V, Fig. 2.

Lithostrotion, E. Luidius, 1760, Lithophyl. Brit. Ichnogr., p. 120, pl. 23, fig. 1.

„ Parkinson, 1820, Organic Remains of a former World, II, p. 42, pl. 5, fig. 3 and 6.

Astrea basaltiformis, W. B. Conybeare and W. Phillips, 1822, Outline Geol. England and Wales, p. 359.

Lithostrotion striatum, Fleming, 1828, Brit. Anim., p. 503.

„ *basaltiforme*, Milne Edwards and J. Haime, 1852, Brit. Foss. Corals, p. 190, pl. 38, fig. 3.

„ „ Idem., 1860, Hist. Nat. Coralliaires, III, p. 429.

Corallum astræiform, with prismatic corallites of five or six sides completely united by their walls. The calices are unequal, and their diagonal varies from ten to fifteen millimetres. The columella is small and compressed, but slightly swollen in the middle; the septa, numbering from forty to sixty, are thin, and alternately a little unequal, only the larger ones reaching the columella. The interseptal loculi are full of innumerable dissepiments. The external surface of each corallite is ornamented with longitudinal costæ and faint transverse lines of growth.

Dimensions.—This corallum can attain large dimensions, its diameter sometimes exceeding several decimetres.

Formation and Localities.—This species has been found in England, Ireland, and Russia, in the middle beds of the Carboniferous Limestone. Mr. W. B. Clarke sent me some specimens of it from a very hard bluish limestone, found on the banks of the Murrumbidgee.[1]

Genus—CYATHOPHYLLUM, *Goldfuss.*

CYATHOPHYLLUM INVERSUM, *L. G. de Koninck.*

Pl. V, Fig. 4.

Corallum simple, cone-shaped, of moderate size, slightly curved; the epitheca seems to have been very thin, and the rings of growth well marked. The calice is circular, moderately deep, and thickened at the brim. There are forty-two thin primary septa, slightly arched in the greater part of their length, and distinctly twisted in the centre of the calice. An equal number of secondary septa, only one-third as long, alternate with the primary septa, to which they are united by convex lamellæ, the convexity of which is turned to the external margin, while the vesicles filling the interseptal loculi between the extreme edges of the secondary septa and the centre of the coral have their convexity turned to the centre of the coral. I could find no fossula.

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[1] [There are no Carboniferous beds on the Murrumbidgee, vide R. Etheridge, junr., Mem. Geol. Survey N. S. Wales, Pal. V, Pt. 1, 1891, p. 6.—W.S.D.]

Dimensions.—The incomplete specimen before me is only four centimetres long, but its probable normal length is seven centimetres. The diameter of the calice is three and a half centimetres.

Distinguishing Characteristics.—According to my learned and excellent friend, Mr. J. Thomson, this species differs from all its known congeners by the form and arrangement of its septa, and also by the quite unique arrangement of the vesicles which fill the interseptal loculi. The species which it seems most to resemble in its internal structure is *Cyathophyllum regium,* J. Phillips; but as the latter is always compound and astræiform, it cannot be confounded with the former.

Formation and Localities.—I cannot positively assert that this species is Carboniferous, although all the others from the same locality, Colocolo, do belong to that formation.

Genus—LOPHOPHYLLUM, *Milne Edwards and J. Haime.*

1. Lophophyllum minutum, *L. G. de Koninck.*

Pl. V, Fig. 5.

Corallum rather short, like a small bent horn, with a deep circular calice, covered by a thick epitheca, ornamented with closely-packed longitudinal costæ and faint rings of growth. The septa number thirteen,[1] two extending to the centre of the calice, and serving as a limit to the fossula, in the middle of which is another septum only two-thirds the length of the adjoining septa. There is no trace of endothecal dissepiments. The columella is a little compressed laterally, and slightly eccentric.

Distinguishing Characteristics.—This species is closely allied to my *Lophophyllum breve,* having the same number of septa, but differing from it by its general shape, which seems to me more slender, and above all by the longitudinal costæ of its external surface. In this last characteristic it resembles *Lophophyllum eruca,* McCoy, from which it differs by its two septa reaching the centre of the calice, the species described by McCoy having only a single septum extending beyond the others and reaching the columella.

Dimensions.—The diameter of the calice is seven millimetres. I am unable to give the other dimensions, owing to the fragmentary state of the specimens.

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[1] [Fig. 5a, however shows eighteen septa.—T.W.E.D.]

Formation and Localities.—Mr. James Thomson found this species in the shales which, in Scotland, form the base of the Carboniferous Limestone, which I consider analogous to the Visé Limestone. A single specimen was found at Burragood, on the Paterson, New South Wales.

2. LOPHOPHYLLUM CORNICULUM, *L. G. de Koninck.*[1]

Pl. V, Fig. 6.

Corallum conical, of moderate size, slightly curved, with its external surface all but perfectly smooth in spite of its thin epitheca. The calice is very deep and circular, with sharp, straight edges. The primary septa, thirty-six in number, are thin, and all reach the columella, alternating with the same number of secondary septa very little developed. The columella is central and slightly compressed laterally. The fossula is large and deep, and its position corresponds to neither of the two curves of the coral, being sometimes to the right and sometimes to the left.

Dimensions.—The length is about three centimetres, and the diameter of the calice one and a half centimetres.

Distinguishing Characteristics.—This species is rather like *Lophophyllum Konincki*, Milne Edwards and J. Haime, but differs in shape, by its smooth surface, by the number of its septa, and above all by the lateral position of the fossula.

Formation and Localities.—Specimens of this species were found at Colocolo in a greyish and in a reddish limestone, coloured by oxide of iron. Most of them were casts.

Genus—AMPLEXUS, *Sowerby.*

AMPLEXUS ARUNDINACEUS, *Lonsdale.*[2]

Amplexus arundinaceus, Lonsdale, 1845, in Strzelecki's Phys. Descr. N. S. Wales and V. D. Land, p. 267, pl. 8, fig. 2.

„ „ M'Coy, 1847, Ann. Mag. Nat. Hist., XX, p. 228.

Corallum rather long, cylindro-conical, more or less curved at its base. The external surface is ornamented with well-marked longitudinal costæ, crossed by numerous folds or rings of growth. Lonsdale says the septa are numerous, and his figure indicates alternating rudimentary septa. The tabulæ seem to be covered with small protuberances, and the fossula is not well developed. In these two last characteristics it resembles *Zaphrentis cylindrica*, Scouler, and possibly it should be placed in the same genus and next to it, but the specimens sent me are too imperfect to enable me to decide.

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[1] [This species has been redescribed by Mr. R. Etheridge, junr., from specimens from Parish Barford, County Durham, and Greenhills, near Paterson. Mem. Geol. Survey N. S. Wales, Pal. V, Pt. I, 1891, p. 18.—W.S.D.]

[2] [Mr. Etheridge has shown that this *Zaphrentis* is closely allied to Dr. Hinde's *Plerophyllum*. Mem. Geol. Survey N. S. Wales, Pal. V, Pt. 1, p. 9.—W.S.D.]

Formation and Localities.—Strzelecki found this species at Shoalhaven and Barbers,[1] and Mr. McCoy at Curradullas, New South Wales. The specimens sent me by Mr. W. B. Clarke are chiefly external impressions, found abundantly at Colocolo in a yellowish-brown limestone of Carboniferous age. The age of the limestone is satisfactorily proved by the presence in it of *Griffithides Eichwaldi*, Fischer, and of *Cladochonus brevicollis*, McCoy.

Genus—ZAPHRENTIS, *Rafinesque and Clifford.*

ZAPHRENTIS PHILLIPSI ? *Milne Edwards and J. Haime.*[2]

Zaphrentis Phillipsi, Milne Edwards and J. Haime, 1851, Polyp. Foss. Terr. Pal., p. 332, pl. 5, fig. 1.

„ „ *idem*, 1852, Mon. Brit. Foss. Corals, p. 168, pl. 34, fig. 2.

„ „ L. G. de Koninck, 1872, Nouv. Rech. Anim. Foss. Terr. Carb. Belg., p. 96, pl. 10, fig. 2.

In spite of his immense experience in the classification of Carboniferous corals, my learned friend, Mr. J. Thomson, is unable to state with certainty the species of the small specimen he has kindly examined for me. It is too imperfect a specimen to be figured. He describes it thus:—"Corallum small, in shape a bent cone, circular in section; epitheca thick; septa, numbering twenty-two, perfectly distinct, re-uniting in groups, and extending to the centre of the visceral cavity. The primary septa alternate with an equal number of secondary ones. The fossula reaches the centre, and is bounded by two primary septa, strongly bent in contrary directions, having their concavity turned away from the side of the fossula."

Dimensions.—The diameter of the fragment described is only about six millimetres, and is probably part of a young individual.

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[1] [This locality is probably Barber's Creek.—T.W.E.D.]

[2] [There is great probability that the specimen examined by De Koninck is *Zaphrentis Culleni*, Eth. fil., and not *Phillipsi.* Vide Mem. Geol. Survey N. S. Wales, Pal. V, Pt. 1, 1891, p. 13.—W.S.D.]

Formation and Localities.—The only specimen found came from a brown Carboniferous limestone at Colocolo; but I am not satisfied as to its exact determination. Mr. J. Thomson found it in the shales at the base of the Carboniferous Limestone of Scotland.

2. ZAPHRENTIS GREGORYANA, *L. G. de Koninck.*[1]

Pl. V, Fig. 7.

Corallum of moderate size, shaped like a horn slightly bent, with faintly-marked lines of growth. The epitheca is thin, and allows some strongly-marked longitudinal costæ to make their appearance, usually simple on the convex side of the curve, but a good number of them bifurcating by interposition on the concave side. The calice is circular and moderately deep. There are thirty-six septa, all much thicker towards the outside than the inside, all converging to and slightly curving themselves towards the centre; most of them are joined by irregular dissepiments, especially those parts nearest the circumference of the coral. The fossula is large, does not quite reach the centre, is divided by a small medial septum, and is placed on the side of the smaller curve.

Dimensions.—The length is five centimetres, and the diameter of the calice two centimetres.

Distinguishing Characteristics.—This species resembles *Z. Cliffordana*, Milne Edwards and J. Haime, in the position and shape of its fossula; it differs from it by its greater size and by the arrangement of its costæ.

Formation and Localities.—Mr. J. Thomson found this species in the shales underlying the Carboniferous Limestone of Scotland. In New South Wales it has been found at Jervis Bay and at Colocolo in a blackish-grey calcareous sandstone.

ZAPHRENTIS CAINODON, *L. G. de Koninck.*[2]

Pl. V, Fig. 8.

Corallum conical, slightly curved, long in proportion to its diameter. The calice is slightly oval and deep, with thin edges. The epitheca has disappeared, but was probably thin and smooth, as there are no traces of rings of growth. The septa number forty, those on the side of the large curve being shorter than the others. They are more or less recurved upon themselves, and unite near the centre into two lateral groups, producing a fossula which reaches beyond the centre of the calice, and occupies a lateral position. In the marginal part of this fossula are three accessory septa, the middle one being smaller and less distinct than the other two.

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[1] [*Zaphrentis (Plerophyllum ?) Gregoriana*, R. Etheridge, junr., Mem. Geol. Survey N. S. Wales, Pal. V, Pt. 1, p. 11.—W.S.D.]

[2] [*Zaphrentis* (*Plerophyllum ?*) *cainodon*, R. Etheridge, junr., Mem. Geol. Survey N. S. Wales, Pal. V, Pt. 1, 1891, p. 10.—W.S.D.]

Dimensions.—The total length is from four to five centimetres; the larger diameter of the calice is thirteen millimetres, and the smaller eleven millimetres.

Distinguishing Characteristics.—This species bears some resemblance to the preceding, but differs from it by the number of its partitions and the length of its fossula.

Formation and Localities.—Mr. J. Thomson found this species in Scotland, associated with the preceding. In New South Wales it was found at Burragood, on the Paterson.

ZAPHRENTIS ROBUSTA, *L. G. de Koninck.*[1]

Pl. V, Fig. 9.

Corallum turbinate, dumpy, slightly curved, with a circular and deep calice. Epitheca thick and marked with numerous irregular lines of growth, and obtuse, longitudinal, equal costæ. There are thirty-six slightly-flexuous septa, not reaching quite to the centre of the calice, the bottom of which can be seen. A very narrow fossula is situated on the side of the small curve, and does not quite reach the centre. Besides the principal septum, there are in it two faintly-indicated secondary septa.

Dimensions.—The only fragment of this species I have seen is three centimetres long; the diameter of the calice is twenty-one millimetres; and the thickness of its epitheca, two millimetres.

Distinguishing Characteristics.—This species differs from the preceding by its turbinate form, the greater proportional diameter of its calice, and above all by the thickness of its epitheca.

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[1] [*Zaphrentis (Plerophyllum ?) robusta*, R. Etheridge, junr., Mem. Geol. Survey N. S. Wales, Pal. V, Pt. 1, 1891, p. 14.—W.S.D.]

Formation and Localities.—It is found in Scotland with the two preceding species, and in New South Wales at Burragood, on the Paterson.

As the calice of this specimen is filled with a brownish compact limestone, I infer that the fossil was found in a similar bed, which has probably not yet been examined, as I have not found traces of it on any other fossil.

Genus—CYATHAXONIA, *Michelin.*

CYATHAXONIA MINUTA, *L. G. de Koninck.*

Pl. V, Fig. 10.

Corallum forming a long slightly curved cone, the surface of which is ornamented with small longitudinal costæ, crossed by rings of growth. It is circular in transverse section. The transverse section of the columella is oval. The epitheca is relatively thick. The septa, twenty in number, are each formed of two lamellæ, uniting at some distance from the wall before reaching the columella, around which they radiate. The columella is hollow, pierced throughout by a small canal, and is oval in section.

Dimensions.—These measurements are approximate only, as the specimen was very imperfect. Length, from fourteen to fifteen millimetres; diameter, from four to five millimetres.

Distinguishing Characteristics.—This species differs from *C. cornu*, Michelin, its nearest neighbour, by the thickness of its epitheca, and by its external longitudinal costæ.

Formation and Locality.—A single specimen was found at Burragood.

Order—**TUBULOSA.**

Genus—CLADOCHONUS, *McCoy.*

CLADOCHONUS TENUICOLLIS, *McCoy.*[1]

Pl. VII, Fig. 2.

Cladochonus tenuicollis, McCoy, 1847, Ann. Mag. Nat. Hist., XX, p. 227, pl. 11, fig. 8.

The corallum consists of a series of corallites, resembling in shape an ordinary clay pipe, when isolated. The corallites are united near the bases of their calices, and extended into a rather long and thick pedicle. The insertion of the calices is alternate. The septa are indicated by fine longitudinal striæ on the internal wall of the calice.

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[1] [*Vide* Mem. Geol. Survey N.S. Wales, Pal. V, Pt. 1, 1891, p. 30. Specimens have been found at several other places in the Carboniferous area.—W.S.D.]

Dimensions.—Length of each corallite is from ten to eleven millimetres, diameter of the calice from two to three millimetres.

Distinguishing Characteristics.—This species can easily be distinguished from *C. Michelini,* Milne Edwards and J. Haime, by the thickness of its pedicle, and by the regular alternation of its calices. It differs from *C. crassus,* McCoy, by the length of its pedicle.

Formation and Localities.—Mr. McCoy tells us that this species is common in the Carboniferous shales of Dunvegan; Mr. W. B. Clarke found it at Burragood, in an argillaceous dull yellowish-grey limestone.

Section—TABULATA.

Genus—SYRINGOPORA, *A. Goldfuss.*[1]

1. SYRINGOPORA RETICULATA, *A. Goldfuss.*

Pl. VII, Fig. 3.

Syringopora reticulata, A. Goldfuss, 1826, Petref. Germ., I, p. 76, pl. 25, fig. 8.
" " Milne Edwards and J. Haime, 1852, Mon. Brit. Foss. Corals, p. 162, pl. 46, fig. 1.
" " F. Roemer, 1870, Geol. v. Ober-Schlesien, p. 60, pl. 7, fig. 11.
" " L. G. de Koninck, 1872, Nouv. Rech. Foss. Terr. Carb. Belg., p. 123, pl. 11, fig. 7, and pl. 12, fig. 1 (for synonymy).

Corallites very long, generally rather straight, sometimes slightly flexuous; feebly converging but nearly parallel, distant from one another by about the length of their diameter, surrounded by a finely-wrinkled thick epitheca; the tubular connecting processes are numerous, regularly spaced at distances varying from two to four millimetres, according to the specimens.

Dimensions.—This species often forms very large colonies, and its corallites have a mean diameter of one and a half millimetres.

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[1] [In connection with De Koninck's figures of these two species of *Syringopora* (Pl. VII, fig. 3 and 4) Mr. R. Etheridge, junr., says "The figure of the first-named [*S. reticulata*] has very much the appearance of an irregularly grown, openly fenestrate *Fenestella* seen from the reverse side. That of the second species closely resembles the impression of some of our *Protoretepora*." Mem. Geol. Survey N. S. Wales, Pal. V, Pt. 1, p. 29.—W.S.D.]

Formation and Localities.—This species is widespread in the Carboniferous Limestone of Belgium, France, England, and Russia. One of the two Australian specimens sent me came from the Muree Quarry, out of a yellowish-grey argillaceous limestone; and the other from a similar, but darker, limestone from the Ichthyodorulite Range on the banks of the Karua.

SYRINGOPORA RAMULOSA? *A. Goldfuss.*

Pl. VII. Fig. 4.

Syringopora ramulosa, A. Goldfuss, 1826, Petref. Germ., I, p. 76, pl. 15, fig. 7.

" " Milne Edwards and J. Haime, 1852, Mon. Brit. Foss. Corals, p. 161, pl. 46, fig. 3.

" " L. G. de Koninck, 1872, Nouv. Rech. Foss. Terr. Carb. Belg., p. 126, pl. 12, fig. 2 (for synonymy).

I am not quite satisfied as to the determination of the Australian specimen before me, although it bears a decided resemblance to that which Milne Edwards and J. Haime have figured on Pl. 46, Fig. 3 of their Monograph. It is composed of a number of branches of nearly equal thickness and joined together, having probably formed a base for the colony.

Formation and Localities.—This coral was exposed on a piece of greyish argillaceous limestone at Burragood, and its Carboniferous origin is established by the fact that the same piece of limestone contains an undoubted fragment of *Productus semireticulatus,* Martin.

Genus—FAVOSITES, *Lamarck.*

FAVOSITES OVATA, *Lonsdale.*[1]

Pl. III, Fig. 5.[2]

Stenopora ovata, Lonsdale, 1844, In Darwin's Geol. Obs. Volc. Islands, p. 163.

" " Idem, 1845, In Strzelecki's Phys. Descr. N. S. Wales and V. D. Land, p. 263, pl. 8, fig. 3.

" " McCoy, 1847, Ann Mag. Nat. Hist., XX, p. 226.

Chætetes ovata, Dana, 1849, Geol. Wilkes, U. S. Explor. Exped., p. 712, pl. 11, fig. 7.

Chætetes? ovata, Milne Edwards and J. Haime, 1851, Polyp. Foss. Terr. Pal., p. 273.

Corallum branching, with cylindrical, thin, diverging branches, composed of a large number of small corallites, having their origin in the very centre of the branches, from whence they extend obliquely towards the surface. The calices are small and nearly circular. The walls are thick, and pierced by a large number of irregularly placed mural pores, some of which are on the angles, and some on the sides, of the walls. The tabulæ, which have been carefully described by Dana, are rather close together and regularly spaced.

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[1] [This is now known as *Stenopora ovata,* Lonsdale. R. Etheridge, junr., Mem. Geol. Survey N. S. Wales, Pal. V, Pt. 1, 1891, p. 55.—W.S.D.]

[2] [Pl. VII, fig. 5.—W.S.D.]

Dimensions.—This coral appears to have reached a considerable length. One specimen found by Mr. W. B. Clarke, although broken at both ends, measures seven centimetres long, and that figured by Lonsdale is ten centimetres long. The diameter of the branches of the first is only from three to ten millimetres, while that of the second is fifteen millimetres.

Distinguishing Characteristics.—This species, in its general form, resembles certain specimens of *Chætetes tumida*, Phillips, from Glasgow, which Mr. R. Etheridge, Junr., has recently described.[1] The observations of the learned Palæontologist of Edinburgh have shown me that ***Favosites ovata*** differs from this ***Chætetes*** by having mural pores, and by the diameter of its corallites being greater. Also that this species is entirely different from that which I have described under the name ***Monticulipora tumida,*** as I shall be able to prove further on.[2]

Formation and Localities.—Strzelecki found this species at Mounts Wellington and Dromedary, and in the Norfolk Plains, Tasmania; Dana found it at Harper's Hill, and Mr. Clarke at Glen William, in a blackish limestone, and in a greyish limestone at Burragood, N. S. Wales. McCoy says it is common in the sandstone at Darlington, New South Wales.

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[1] Ann. Mag. Nat. Hist., xxiii (4), p. 194.

[2] It should be noted that the type species described by J. Phillips and re-examined by R. Etheridge comes from the upper beds of the Carboniferous Limestone, while that figured by me belongs to the lower beds of this same limestone.

Class—ECHINODERMATA.

Order—CRINOIDEA.[1]

Genus—SYNBATHOCRINUS—*Phillips.*

SYNBATHOCRINUS OGIVALIS, *L. G. de Koninck.*

Pl. VI, Fig. 1.

The calyx is small, and shaped like a rather short truncated cone. As in all the species of this genus, the basal plate is single and but slightly developed, having a length of only one millimetre, although its diameter may be five millimetres. The surface by which the basal plate is united to the column is circular and slightly depressed, with a diameter of three millimetres; in the centre is a very small circular aperture corresponding to the canal of the column. The five radials which complete the calyx have all about the same size and shape; this shape is that of an inverted equilateral triangle, with a truncated apex by which they are joined to the basal plate. The surface of each radial bears three folds, which, having a common origin in the centre of each piece, are directed, one vertically towards the base, and the others obliquely right and left towards the two lateral angles, thus producing a design something like a capital Y. By the juxtaposition of these radials, and the junction of the extremities of their ornamental folds, hollows are formed, comparable to those of Gothic arches, easy to comprehend from this design YYY. Their articular edges are large, and slope a little from back to front.

Distinguishing Characteristics.—*Synbathocrinus ogivalis* cannot be confounded with *S. conicus*, Phillips, the only species of this genus really known, because its cup is much shorter and more expanded, and above all it has some segments that are entirely wanting in *S. conicus.*

Formation and Locality.—A single specimen of this pretty species was found in a yellowish, argillaceous, friable limestone at Burragood, on the Paterson.

Genus—POTERIOCRINUS, *Miller.*

Among the Carboniferous fossils submitted to me for examination I have found only two fragments which may belong to this genus. One is a basal, and the other a radial plate, of closely allied species. The basal may belong to *P. tenuis*, and the radial to *P. radiatus*, or they may both belong to the same species. These fragments, which I am unable to determine more accurately, were found in the same limestone as the preceding species.

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[1] I must point out that in the descriptions of the species I have employed the nomenclature laid down in my "Monographie des Crinoides carboniferes de Belgique."

Genus—ACTINOCRINUS, *Miller.*

ACTINOCRINUS POLYDACTYLUS, *Miller.*[1]

Pl. VI, Fig. 3.

Encrinus, Cumberland, 1819, Trans. Geol. Soc. London, V, p. 90, pl. 2, fig. 8.

Actinocrinus polydactylus, Miller, 1821, Nat. Hist. Crin., p. 103, pl. 1, fig. 1 and 2 (fig. *cæt. exclusis*).

" " Agassiz, 1835, Mém. Soc. Neuchâtel, I, p. 197.

" " J. Phillips, 1836, Geol. Yorkshire, II, p. 206, pl. 4, fig. 17 and 18.

" " L. G. de Koninck, 1842, Descr. Anim. Foss. Terr. Carb. Belg., p. 51, pl. G, fig. 3.

" " L. G. de Koninck and H. Le Hon, Rech. Crinoïdes Terr. Carb. Belg., p. 134, pl. 4, fig. 2.

Although I have had at my disposal only the internal cast of a nearly complete calyx, I have not hesitated, in spite of the absence of all trace of ornamentation, to identify this as *A. polydactylus*, Miller. The shape, the number, and arrangement of all the pieces, are so like the corresponding pieces in more perfect specimens, with which I have compared them, that I have no doubt of their identity. For the detailed description see the works quoted above.

Horizon and Localities.—This species is not uncommon in the Carboniferous Limestone near Hook Point, Ireland. It is, however, very rare in the Tournay Limestone. In Australia it is found in a greyish sandstone at Glen William.

Genus—PLATYCRINUS, *Miller.*[2]

This genus is represented, among the specimens collected by the Rev. W. B. Clarke, only by the impression of a few joints of the column, and by the complete base of a small individual (Pl. VI, fig. 6). These pieces belong, if not to *P. lævis*, Miller, at least to a closely allied species, but they are not sufficiently characteristic to decide the point. The base, composed of thin pieces united into a widely expanded cup, has a diameter of four millimetres only, and is nearly one millimetre high.

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[1] [*Vide* R. Etheridge, Junr., Mem. Geol. Survey N.S. Wales, Pal. V, pt. 2, 1892, p. 77, pl. 20, figs. 6, 7.—W.S.D.]

[2] [*Op. cit.*, p. 80.—W.S.D.]

Horizon and Localities.—The fragments in question were found, some in a yellowish-grey sandstone at Glen William, others in a grey argillaceous limestone between the Hunter and Rouchel Rivers, and at Burragood, on the Paterson.

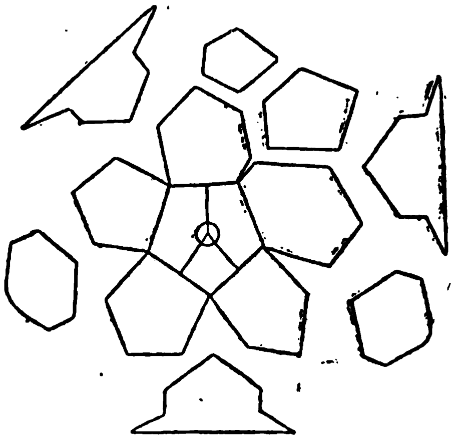
Genus—TRIBRACHYOCRINUS, *McCoy.*

TRIBRACHYOCRINUS CLARKEI, *McCoy.*[1]

Pl. VI, Fig. 5.

Tribrachyocrinus Clarkei, McCoy, 1847, Ann. Mag. Nat. Hist., XX (1), p. 228, pl. 12, fig. 2.

The calyx of the type specimen of this the only species yet known of this somewhat anomalous genus can acquire considerable proportions, and attain a diameter of from five to six centimetres. A nearly perfect specimen of average size will serve to give an exact description of it, which will be rendered clear by a horizontal projection of its various pieces. The base is composed of three basals, of which two are larger than the third, and pentagonal in form, the small one being tetragonal. The arrangement of these pieces is exactly that of the basals of *Platycrinus.* This base is slightly raised, so as to form a very wide cup with a pentagonal rim. To each of the five edges is joined a sub-radial, three of which are also pentagonal, while the other two, adjacent



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[1] [R. Etheridge, Junr., *Op. cit.*, pp. 80–94, pl. 13, figs. 2–4, pl. 14, fig. 3, pl. 15, figs. 6–8 ? 5, pl. 17, figs. 2–4.—W.S.D.]

and placed on the anal side, have six sides, two of which are very short.[1] One of these hexagonal pieces is very like the three pentagonal pieces, but the other seems to be distorted and thrown more to one side than the other. It is this conformation which makes the calyx appear gibbous, and, when in horizontal section, oval, instead of circular like most Crinoidea, its anal side not following the circular curve of the other sides. All the pieces are rather longer than broad. The primary radials are a little wider than long, especially towards their articular extremities, which are much elongated. There are only three primary radials, which constitutes a decided anomaly in the general structure of Crinoidea; the sides are also strongly contracted towards their upper extremity. The very shape of these primary radials is something special, rarely seen in any other genus, it being something like a heraldic shield, the upper part of which is produced right and left. The pointed extremities of each join similar extremities of adjacent primary radials, and thus enclose the sub-cordiform inter-radials, which lie between and separate the primary radials. The inter-radials are, properly speaking, only two in number, because the third piece, although nearly of the same shape as the others, is joined to the two[2] anal pieces of the irregular side, and is partly united to them. Although it is probable that there are at least three anal pieces, I have been able to observe only two, including that which I consider analogous to the inter-radials properly so called, on account of the imperfect state of the anal side of the only specimen complete enough in its other parts that I have had at my disposal. With the exception of the first brachial pieces, the pieces forming the cup are not very thick, and are easily distinguished from one another by well-marked sutures in the form of grooves. Their surface is generally smooth, judging from the external casts sent me, but it is possible to see at the edges of some of the sub-radials a small number of irregular faintly-marked lines of growth, as Professor McCoy has correctly observed.

Dimensions.—The only sufficiently perfect specimen, that has served for this description, was three and a half centimetres long; its greater diameter was four centimetres, and its smaller diameter three centimetres; but various fragments lead me to suppose that the calyx of this species may reach twice this size.

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[1] [That is one side in each plate, as shown in the diagram.—T. W. E. D.]

[2] [Only one anal plate, however, in addition to the third inter-radial (azygous or radianal) plate, appears to have been figured in the above diagram, in which a space has been reserved below the upper extremity of the "primary radial" shown on the right hand side of the above diagram. Reference to McCoy's, Ratte's, and Etheridge's plates confirms this supposition.—T. W. E. D.]

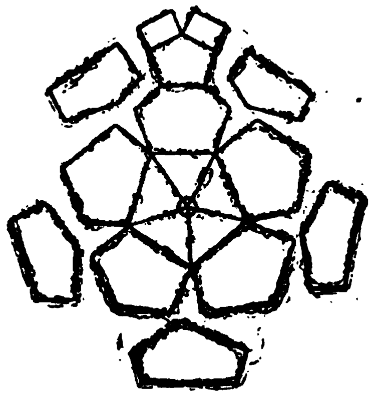
Horizon and Localities.—This beautiful species, which Mr. McCoy has rightly dedicated to the Rev. W. B. Clarke, who sent it to him, appears to occur rather frequently in a friable, micaceous, greyish or reddish sandstone found at Muree Quarry, Raymond Terrace, at the junction of the Williams River with the Hunter. Mr. McCoy says he has received it from Darlington, Australia, where it is found in a rather friable grey shale.

Genus—CYATHOCRINUS, *Miller*.

CYATHOCRINUS KONINCKI, *W. B. Clarke*.

Pl. VI, Fig. 4.

An Pentadia corona? Dana, 1849, Geol. Wilkes, U. S. Explor. Exped., p. 718, pl. 10, fig. 10.



I know no other Crinoid whose calyx attains such a large size as this one. The calyx is globular, resembling a large pomegranate. The base, nearly regularly pentagonal, shows a rather deep hollow resembling a five-rayed star, each ray corresponding to one of the sutures of the five basals.[2] The sub-radials are large, nearly as long as broad, and irregularly arched in the centre; four of them are rather regularly pentagonal; the fifth corresponds to the irregular side of the calyx, and is hexagonal; its truncated apex unites with an anal piece very much smaller than itself; this anal piece is surmounted by two other pieces still smaller. The radials are all of nearly the same shape, irregularly pentagonal, two of their sides being smaller than the others, the pieces are broader than long; their articular edges for the arms are very broad, and their internal margin is sigmoidal, as in *C. granulatus*, Phillips.

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[1] [*Phialocrinus Konincki. Vide* R. Etheridge, Junr., Mem. Geol. Survey N.S. Wales, Pal. v, pt. 2, 1892, p. 107, pl. 16, figs. 1-4.—W.S.D.]

[2] [The position of the sutures between the five "basals" in the above diagram does not agree with their position, as shown on pl. vi, figs. 4a and 4b, accompanying this work. In the last two plates the sutures between the "basals" are clearly shown to alternate in position with the sutures between the "sub-radials."—T.W.E.D.]

Having had at my disposal only internal, but very perfect, casts of this species, I can say nothing positive about the ornamentation with which the external surface may have been furnished; but in carefully examining each sub-radial impression, one can easily see five folds, faintly indicated, springing from a common central well-defined point, and directed perpendicularly towards the middle of each of the five sides. This arrangement presents a great analogy to the fossil figured and described by Dana under the name *Pentadia corona* (Pl. IV, fig. 10a). Indeed, this fossil corresponds so well in form and size with the sub-radials of our *Cyathocrinus*, that I am led to believe it may be nothing more than one of these plates. In that case these sub-radials would be ornamented, not only with the radiating costæ that I have just mentioned, but also with concentric granulated striæ parallel to the margins, of which Dana's Figs. 10*b* and 10*c* give a very good idea. The calyx, the middle of which is much inflated, narrows at its summit, so that the circumference intended to receive the insertion of the arms has only half the diameter of the largest diameter of the calyx taken at about the middle of its elevation. The column must have been relatively very thin, judging from the small size of the surface intended for the insertion of the topmost joint.

Dimensions.[1]—The total length of the calyx is fifty-five millimetres; the diameter, eighty millimetres; the average length of the sub-radials, forty millimetres; the transverse diameter of the same, forty-seven millimetres; the length of the radials, twenty-seven millimetres; the transverse diameter of the same, forty-two millimetres; the diameter of the base, forty-four millimetres; and the length and breadth of the first anal piece, sixteen millimetres.

Affinities and Distinguishing Characteristics.—I know of no other species of *Cyathocrinus* which reaches such a large size as this, and which could be confounded with it. It is at the express desire of Mr. W. B. Clarke that I have retained the name under which he sent it to me.

Horizon and Localities.—The internal casts, figured by me, were found in a rather friable greyish sandstone, at Osterley,[2] on the Hunter. *Pentadia corona* comes from the Illawarra.

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[1] The two specimens obtained being slightly imperfect, the measurements given must be considered as only approximate.

[2] [Osterley is a house on the left bank of the Hunter River, between Morpeth and Raymond Terrace, the formation being Upper Marine, and close to the horizon of the Muree Beds.—T. W. E. D.]

Order—**ASTEROIDEA.**

Genus—PALÆASTER, *J. Hall.*

PALÆASTER CLARKEI, *L. G. de Koninck.*[1]

Pl. VII, Fig. 6.

The size of this species surpasses that of all the species of Palæozoic Asteroidea yet known. Its rays measure not less than five centimetres from the centre of the disc to their extremities; they are very thick, and joined to each other for about half their length; the angle formed by the marginal sides at the extremity of each ray is about 75°; their dorsal surface is composed of three rows of strong transverse plates, of a sub-hexagonal form, closely united, and covered with a considerable number of small tubercles, of which the greater part are rounded, and resemble the plates of *Palæchinus ellipticus* and *P. sphericus*, Scouler, while some are only pointed and look like little spines; these last are nearly all marginal. The covered portion of the disc is, unfortunately, in too bad a state of preservation to allow me to see its exact structure; it appears analogous to that of *Palæaster matutina*, Hall, and I observed in it one plate bearing in relief a starred tubercle. The marginal plates have nearly the same width as the principal adjacent plates, but they are only half as long, and, consequently, much more numerous; they differ from the central plates by the presence, on their anterior edges, of a row of large pointed tubercles, numbering five or six for each plate.

The ventral surface shows a strong ambulacral groove, bordered at each side by sixteen or eighteen ambulacral plates of unequal width, presenting altogether a petaloid appearance. The ambulacral plates are very much wider than long, thin in the direction of their length, and arched in that of their breadth; their surface is ornamented with an infinity of small granules, visible to the naked eye; they terminate at the side of the disc by a small auxiliary plate rounded and tuberculiform. It was impossible for me to see exactly the shape of the mouth or of the small plates which surround it. It must be observed that the marginal plates are distinctly visible from the dorsal side, presenting the appearance of a supplementary series of plates on each side of the ray, joined to the three normal series of which it is composed.

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[1] [*Palæaster* (*Monaster*) *Clarkei.*—R. Etheridge, Junr., Mem. Geol. Survey N.S. Wales, Pal. V, p. 2, 1892, p. 71, pl. 14, figs. 1, 2, pl. 15, fig. 4.—W.S.D.]

Relations and Differences.—I know no species which, by its size and robust structure, can be compared to the one I have just described. ***Palæaster eucharis*, J. Hall**, alone among its congeners, in its ventral surface, shows some likeness to it, but its rays are more slender, and its radial plates more numerous. The dorsal surface in the two species differs completely; in the one are some large, polygonal, contiguous, radial plates; and in the other, rounded plates relatively much smaller, more numerous, and separated from each other by countless small intermedial plates, the presence of which alone would prevent confusion.

Formation and Localities.—While the greater number of Palæasters actually known have been collected from Silurian or Devonian rocks, *P. Clarkei* was found in Carboniferous rocks by the learned geologist to whom I have the honour of dedicating it.[1] Unfortunately, the only specimen found is not sufficiently well preserved to allow me to describe it in detail. It consists of the external impressions of the ventral and dorsal surfaces of the same individual; the margins and the central disc have suffered much during fossilization; the solid parts have completely disappeared. This individual was obtained from Russell's Shaft, in a rather friable, calcareous, greenish sandstone, composed of grains generally rather fine, but in places reaching the size of a small pea, giving the rock the appearance of conglomerate.

Class—BRYOZOA.

Order—CYCLOSTOMATA.

Genus—PENNIRETEPORA, *A. d'Orbigny.*

PENNIRETEPORA GRANDIS, *McCoy.*

Pl. V, Fig. 11.

***Glauconome grandis*, McCoy, 1844, Synop. Carb. Foss. Ireland, p. 199, pl. 28, fig. 3.**

***Penniretepora grandis*, A. d'Orbigny, 1850, Prodr. Pal., I, p. 153.**

The cœnecium of this species is formed of one principal branch, the diameter of which is about double that of the lateral branches. The insertion of these latter on the principal branch is alternate, and they are inserted at a more acute angle towards the apex than at the base. The general appearance of the cœnœcium is that of a feather, and its development proceeds on much the same plan. The anterior surface of the different branches is covered with a double row of alternating cells, separated by a mesial keel much more pronounced on the principal branch than on the others; and there are generally three cells on the principal branch between every two points of insertion for the lateral branches. The posterior surface of the branches is striated, and irregularly covered with small tubercles, well marked in the Australian species under my notice.

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[1] I am aware that Salter noted the existence of a fine species of *Palœaster* in the Lower Carboniferous beds of Barnstaple, but I have never been able to see either the description or the figure, and have therefore been unable to compare it with the Australian specimen. [Vide Ann. Mag. Nat. Hist., XX (2), p. 326.]

Dimensions.—The total length is seven centimetres; thickness of the principal branch, about one millimetre at the base; total length, about three centimetres.

Horizon and Localities.—This species was discovered by Mr. C. B. Newenham, in the middle beds of the Carboniferous Limestone near Cork, Ireland, and was first described by Professor McCoy. Mr. W. B. Clarke found it in a rather ferruginous brownish limestone at Burragood, on the Paterson River.

Genus—DENDRICOPORA, *L. G. de Koninck.*

The cœnœcium is formed of a central vertical axis, to which are joined, at irregular distances, lateral branches nearly as important as the axis itself; all these branches give rise to a large number of branchlets, very obliquely inserted, close together and nearly parallel; these branchlets are united at regular distances by crossbars, giving rise to sub-rectangular fenestrules, exactly like those in *Fenestella*. The external surface of the branches and branchlets bears a triple row of cells, and is not keeled.

Relations and Differences.—It is easily seen that this species bears a great resemblance to the genus *Ptylopora* of Scouler, the characteristics of which have been given by McCoy. It differs from it essentially by the great number of its principal lateral branches, of which there is not a trace in *Ptylopora*. At present I know of only a single species of this genus; it comes from the Carboniferous Limestone, and the Rev. W. B. Clarke has dedicated it to one of his friends, Mr. Hardy, of Yass, to whom he was indebted for a number of fossils from the neighbourhood of that town.

DENDRICOPORA HARDYI, *W. B. Clarke.*

Pl. VIII, Fig. 1.[1]

The cœnœcium of this species is in the form of a fan, a little longer than broad. The axis, or principal branch, which is straight, tapers from the base to the apex; both sides of this axis carry two principal lateral or accessory branches; upon one of the sides these principal lateral branches are situated at a short distance from the base, and are inserted at an angle of about 35°; on the other side they spring from near the middle of the length of the axis, at a short distance from each other, the angle of insertion of the upper branch being 35°, while the angle of the lower branch is a little more acute. These four branches all taper from their insertion towards their extremities. The smaller branches, to which all these give rise, are inserted at a very acute angle; they are placed at equal distances from each other, are filiform, and nearly parallel; they are united by cross-bars, giving rise to sub-rectangular fenestrules, generally much longer than broad. The external surface is ornamented with a triple row of cells arranged quincuncially, and closely packed together; it is not keeled; there are ten or eleven small cells on the margins of the fenestrules.

Dimensions.—The length of the largest specimen of this species known to me, but which is very incomplete, is about five and a half centimetres, the breadth four centimetres, and the diameter of the axis does not reach a millimetre at the base.

Formation and Localities.—This species, which has no known analogy, was found with the preceding, associated with *Spirifer glaber,* Martin.

Genus—FENESTELLA, *Lonsdale.*

FENESTELLA PLEBEIA, *McCoy.*

Pl. VIII, Fig. 2.

Fenestella flabellata,	Portlock, 1843, Geol. Londonderry, etc., p. 324, pl. 22, fig. 1, and pl. xxii*a*, fig. 4 (non Phillips).
,, *plebeia,*	McCoy, 1844, Synop. Carb. Foss. Ireland, p. 203, pl. 29, fig. 3 (non Geinitz., Carbonform. und Dyas in Nebraska).
,, *fossula,*	Lonsdale, 1844, in Darwin's Geol. Obs. Volc. Islands, p. 166.

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[1] [Pl. VIII, fig. 4.—W.S.D.

Fenestella fossula,	Lonsdale, 1845, in Strzelecki's Phys. Descr. N.S. Wales, p. 269, pl. 9, fig. 1.
„ „	J. D. Dana, 1849, Geol. Wilkes U. S. Explor. Exped., p. 710, pl. 11, fig. 3.
„ *plebeia,*	A. d'Orbigny, 1850, Prodr. Pal., I, p. 152.
„ „ (partim),	J. Morris, 1854, Cat. Brit. Foss., p. 123.
„ „	McCoy, 1851, Brit. Pal. Foss., p. 114 (non Phillips).
„ *virgosa,*	E. d'Eichwald, 1859, Lethæa Rossica, I, p. 358, pl. 23, fig. 9.
„ *plebeia,*	Ludwig, 1862, Pal. Urals, p. 46, pl. 18, fig. 2.
„ *plebeia ?*	Kirkby, 1862, Ann. Mag. Nat. Hist., X (3), p. 204, pl. 4, fig. 14, 15, 18.
„ „	H. C. Billings und W. Keferstein, 1862–1863, Klassen u. Ordn. Thierr., III, p. 8, fig. 2.
„ *devonica,*	P. Semenow and v. Möller, 1864, Bull. Acad. Imp. St. Pétersbourg, VII, p. 233, pl. 3, fig. 16.
„ *plebeia,*	F. Roemer, 1870, Geol. Ober-Schlesien, p. 60, pl. 7, fig. 9, 10.
„ „	Armstrong, 1871, Trans. Geol. Soc. Glasgow, III, Suppl., p. 34.
„ „	F. B. Meek, 1872, In F. V. Hayden's Final Rept. U. S. Geol. Survey Nebraska, p. 153, pl. 7, fig. 11.
„ „	Idem, idem, Rept. Pal. E. Nebraska, p. 153, pl. 7, fig. 11.
„ *fossula,*	R. Etheridge, 1872, Quart. Journ. Geol. Soc. XXXVI, p. 332, pl. 25, fig. 1.
„ *plebeia,*	L. G. de Koninck, 1873, Nouv. Rech. Anim. Foss. Carb. Belg., II, pl. 1, fig. 3.

The cœnœcium of this species consists of a large number of small branches very thin and straight, often bifurcating, and decidedly parallel. These branches, taken altogether, have the form of a large funnel, and are separated from each other by a space equal to their own diameter; they are joined together by cross-bars still smaller than themselves. These cross-bars alternate, and form rectangular fenestrules, of which the long sides, produced by the branches, have nearly twice the length of the short sides. The anterior surface of the branches has a mesial keel, not well marked, on the sides of which are small cells, the non-marginal openings of which form alternating rows; four or five of these perfectly circular openings occupy each length of the branch between two cross-bars. The posterior surface of the branches is ornamented with fine longitudinal striæ, rather irregular, and not distinctly marked.

Dimensions.—This species is capable of reaching a very large size. I have seen some very incomplete specimens of it which were sixteen centimetres long, and from ten to twelve centimetres broad. I have counted, rather regularly, nineteen fenestrules for each centimetre of length.

Relations and Differences.—After having, with great care, compared the Australian specimens with a large number of specimens collected from the Carboniferous Limestone of Scotland, Ireland, and Belgium, I am convinced that the *Fenestella* described by Lonsdale under the name *F. fossula* differs in no way from that which McCoy has figured under the name *F. plebeia.* Their identity having been established, the question arises which of the two names should have the preference. This question does not appear to me difficult to answer, for, by reference to the list of synonyms given above, it will be seen that the works containing notices of this species appeared in the same year, and probably about the same time; but it must be admitted that Lonsdale's description is very incomplete, and not sufficiently detailed to help one to recognise with certainty the species to which it is applied; while McCoy's description, besides giving more characteristics, is accompanied by an excellent figure, making confusion with allied species impossible. Again, the figure of *F. fossula*, Lonsdale, did not appear until 1845, so that I think the name given by McCoy ought to have the preference, and it is the one I shall adopt. In 1842 I confounded this species with *F. retiformis*, Schlotheim, to which it bears so great a resemblance that, twenty years after, Kirkby made the same mistake. But in comparing two well-preserved specimens of each species, it is easy to see that the fenestrules of *F. retiformis* are oval, while they are rectangular in *F. plebeia;* also that the number of cells between the cross-bars is usually different. It may not be impossible that the species so carefully described by F. B. Meek, under the name of *F. Shumardi*, Prout, is merely a dwarf variety of *F. plebeia*, McCoy.[1]

Horizon and Localities.—As I noted in 1873,[2] this species is found exclusively in the Carboniferous System. I think it is correct to state that it is confined to the middle and upper beds of limestone belonging to this system. It has been pointed out by McCoy in a large number of localities in Ireland.' It is not uncommon about Glasgow, and in certain parts of Derbyshire and Yorkshire. It has been found also in the Ural and at Bleiburg, in Prussia. Lonsdale found it at Mount Wellington, in Tasmania; at Patrick's Plains and Raymond Terrace, New South Wales, and Dana, at Glendon, New South Wales. Mr. Etheridge found it at Gympie and Smithfield Reef, in Queensland. The Rev. W. B. Clarke found it at Glen William, on the Williams River, in a brownish, compact, brittle limestone, in which it accompanies *F. Morrisii*, McCoy, and *Griffithides Eichwaldi*, Fisher.

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[1] F. B. Meek, Report on the Palæontology of Eastern Nebraska, p. 153, pl. 7, fig. 3.
[2] Consult Vol. II of my Recherches sur les Animaux Fossiles, p. 12.

FENESTELLA PROPINQUA, *L. G. de Koninck.*

Pl. VIII, Fig. 3.

Fenestella ampla ? J. D. Dana, 1849, Geol. Wilkes' U. S. Explor. Exped., p. 710, pl. 11. fig. 2 (fig. 1 excl.).

The cœnœcium of this species, which seems not to be of very great size, is shaped like a funnel, very shallow at its upper part, and with walls more or less irregularly folded or waved. The branches are filiform, regular, sub-parallel, and bifurcated towards the top; the cross-bars have the same thickness as the branches; they are sub-equidistant, and give rise to oval fenestrules, the greater diameter of which is from two and a half to three times the length of the smaller. There are seven cells for each fenestrule, and the two rows are separated by a faintly-indicated mesial keel. I could find no trace of striæ or other ornamentation on the exterior surface of this Bryozoa; it appears to be completely smooth.

Dimensions.—The specimen sent me is from four to five centimetres long; its diameter at the upper edge is from three to five centimetres; but it far from complete. The fenestrules are two millimetres long and about three-quarters of a millimetre broad.

Relations and Differences.—This species closely resembles *F. multiporata*, McCoy, by the form and arrangement of its branches; it is easily distinguished from it by the oval form and slight irregularity of its fenestrules, which are rectangular and very irregular in its congener, the inner surface of which also is regularly striated. It seems to me to be identical with that which J. D. Dana has identified with *Protoretepora* (*Fenestella*) *ampla*, Lonsdale, though probably it should be constituted a new species.

Horizon and Localities.—This species accompanies the preceding in the limestone at Glen William. Dana found it at Glendon.

FENESTELLA MULTIPORATA, *McCoy.*

Pl. VIII, Fig. 4.[1]

Fenestella multiporata, F. McCoy, 1844, Synop. Carb. Foss. Ireland, p. 203, pl. 28, fig. 9.
„ „ J. Morris, 1854, Cat. Brit. Foss., p. 123.

The cœnecium is composed of slender, rather elongated, irregularly arranged branches, with numerous bifurcations. Its cross-bars are extremely thin, and all traces of them easily disappear; its fenestrules, rectangular in form, are irregular, and bordered by seven or eight cells on each side; the edges of these cells are slightly tumid and projecting. According to McCoy, the posterior surface is regularly striated.

Dimensions.—The imperfect specimen sent me is only three centimetres long by three to five centimetres broad; its branches are distant from each other about one millimetre, and its cross-bars about three millimetres, taking the average.

Horizon and Locality.—This species, which I have been able to compare with some specimens from Ireland, and about the determination of which I have no doubt, is found in the Upper Carboniferous limestones near Cork. It was found by Mr. W. B. Clarke in a brownish limestone at Burragood, on the Paterson, where it is associated with *Rhynchonella pleurodon,* Phillips.

FENESTELLA INTERNATA, *Lonsdale.*[2]

Fenestella internata, Lonsdale, 1844, In Darwin's Geol. Obs. Volc. Islands, p. 165.
„ „ Idem, 1845, In Strzelecki's Phys. Descr. N. S. Wales and V. D. Land, p. 269, pl. 9, fig. 2.
„ „ F. McCoy, 1847, Ann. Mag. Nat. Hist., xx, p. 226.
„ „ J. D. Dana, 1849, Geol. Wilkes' U. S. Explor. Exped., p. 710, pl. 10, fig. 18.

The cœnœcium is composed of thin branches, forming a fanlike expansion, sub-parallel and very rarely bifurcated. The fenestrules are rectangular, and produced by thin cross-bars; they are a little longer than wide; their breadth equals the diameter of their branches; the cells are small, number two or three to each fenestrule, and are separated by a scarcely apparent keel. According to Lonsdale, the posterior surface is slightly granular.

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[1] [Pl. VIII, fig. 1. *Vide* Etheridge, R. Junr., Geol. and Pal. Q'land, 1892, p. 218, pl. 8, figs. 7, 8.—W.S.D.]

[2] [*Vide* Etheridge, R. Junr., Geol. and Pal. Q'land, 1892, p. 218, pl. 9, figs. 6, 7.—W.S.D.]

Relations and Differences.—This species bears some resemblance to *F. plebeia*, but it differs from it by the small number of cells to each fenestrule, and by the granulations of its exterior surface, which last is striated in *F. plebeia*.

Horizon and Localities.—According to Lonsdale, it is found at Mount Wellington, Tasmania, and at Patrick's Plains and Raymond Terrace, New South Wales. Dana found it at Glendon, and Mr. Clarke in the Ichthyodolurite Range, on the Karua, in a grey limestone.

FENESTELLA MORRISII, *McCoy.*

Fenestella Morrisii, McCoy, 1844, Synop. Carb. Foss. Ireland, p. 202, pl. 28, fig. 13.
„ „ A. d'Orbigny, 1850, Prodr. Pal., I, p. 152.
„ „ J. Morris, 1854, Cat. Brit. Foss., p. 123.

The cœnœcium is fanlike, or more or less arborescent; the branches bifurcate several times before reaching the upper margin; the fenestrules are often irregular, though generally affecting the rectangular form; the crossbars are very thin and sub-equidistant; the cells, numbering six on each side of a fenestrule, are very distinct, and are surrounded by a slight thickening; the median keel separating them is not strongly marked. The posterior surface of the branches is smooth.

Horizon and Localities.—This species, which is not uncommon in the upper beds of the Carboniferous Limestone near Cork, Ireland, was found by Mr. W. B. Clarke in a greyish argillaceous limestone at Burragood, on the Paterson, associated with the species following, and with *Rhynchonella pleurodon*, Phillips, and a large number of fragments of Crinoid stems.

FENESTELLA GRACILIS? *J. D. Dana.*

Fenestella gracilis? J. D. Dana, 1849, Geol. Wilkes' U. S. Explor. Exped., p. 711, pl. 11, fig. 4.

I am not perfectly certain that this species is identical with that described and figured by Dana. It is remarkable for its dendritic form and its slender branches. These branches have no regularity either in direction or arrangement, but there is one principal branch which gives rise, by numerous bifurcations, to nearly all the lateral branches. All the branches are united by very thin cross-bars, of which the direction and distances from each other are very irregular, but the fenestrules are generally longer than wide. The cells which border them generally number six on each side, and are easily distinguished by their marginal enlargement. The posterior surface is unknown to me.

Dimensions.—The only specimen of this species known to me is three centimetres long, by about one and a half centimetres broad. The filiform branches are about one millimetre apart.

Relations and Differences.—This species is very like *F. undulata*, J. Phillips, from which it differs essentially only by the number of its cells. J. D. Dana compares the species described by him with the *F. formosa*, McCoy, which is easily distinguished by the pores with which the median keels of the branches are pierced.

Horizon and Localities.—It accompanies the preceding species. J. D. Dana found it at Glendon, New South Wales.

Genus—PROTORETEPORA, *L. G. de Koninck.*[1]

The cœnœcium is infundibuliform, composed of numerous coalescing branches, generally bifurcating several times before reaching their complete development, and radiating from the thin peduncle, which forms their starting point. By this radiating arrangement the branches give rise to regular rows of little holes, or fenestrules, oval in outline, which are regular in their course, and parallel. The whole internal surface is covered with numerous rows of small cells, generally arranged quincuncially. The surface is almost smooth, or covered with a large number of fine scarcely visible longitudinal striæ.

Relations and Differences.—This genus, of which *F. ampla*, Lonsdale, may be considered the type, has been created for a certain number of Palæozoic Bryozoa, which, in general form, bear some resemblance to species of the genus *Retepora*, found in Tertiary rocks, and alive in our present seas. It is, however, very easy to distinguish them from each other, because, in the

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[1] [*Vide* Etheridge, R. Junr., Geol. and Pal. Q'land, 1892, pp. 219–222.]

Retepora proper, the branches are sinuous and form meshes, and not regular rows of fenestrules. Its likeness to the genus *Phyllopora*, W. King, is still greater, as it differs essentially from it only by the fact that its cells cover the internal surface, while among the *Phyllopora* it is just the reverse; among these last, again, the cells are less closely packed, and more regularly arranged in lines. These two characteristics I consider sufficient to prove a different organization of the animals belonging to each group, and authorise a generic separation. *Protoretepora* is distinguished from *Polypora*, McCoy, and *Synocladia*, W. King, by the absence of cells on the cross-bars which join the various branches in the first, and by the small keels serving to bound and separate the rows of cells in the second. Again, the fenestrules of these last have a polygonal form, which makes them easy to recognise.

Geological Distribution.—After having studied most of the forms which present some analogy to the species that I now propose to constitute a new generic group, and having carefully compared them, I am convinced that no species of this group is anterior to the Devonian, or posterior to the Carboniferous Period. The principal species, most of which have been described under the generic names of *Fenestella*, and *Polypora*, are as follows:—

1. Protoretepora balaniana, *A. d'Orbigny*,⁽¹⁾ Retepora retiformis, *Michelin*, non *Schlotheim*⁽²⁾=Fenestella antiqua, *Lonsdale*, non *Goldfuss*.⁽³⁾
2. Protoretepora (Polypora) mexicana, *H. A. Prout*.⁽⁴⁾
3. „ (Polypora) Shumardii, *H. A. Prout*.⁽⁵⁾
4. „ (Fenestella) ampla, *Lonsdale*.⁽⁶⁾
5. „ (Polypora) Halliana, *H. A. Prout*.⁽⁷⁾
6. „ (Polypora) hamiltoniana, *H. A. Prout*.⁽⁸⁾

Of these six species, the first only is Devonian, and is found in the upper beds of that system; the others are Carboniferous. So far none of these last have been met with in Europe.

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(1) Prod. Pal., I, p. 100.
(2) Mon. Zoophyt., p. 190, pl. 49, fig. 7.
(3) Geol. Trans., Sec. Ser., Vol. V (2), and Phillips, Pal. Foss. Cornwall, p. 84, pl. 12, fig. 38.
(4) Trans. Acad. Sc. St. Louis, I, pl. 16, fig. 2.
(5) *Ibid.*, pl. 16, fig. 3.
(6) Strzelecki, Phys. Descr. N. S. Wales and V. D. Land, p. 268, pl. 9, fig. 3.
(7) Procs. Acad. Sc. St. Louis, I, p. 680, and Geol. Survey Illinois, II, p. 411, pl. 11, fig. 6.
(8) *Ibid.*, II, p. 124, pl. 10, fig. 6.

PROTORETEPORA AMPLA, *Lonsdale*.(1)

Pl. VIII, Fig. 4.(2)

Fenestella ampla, Lonsdale, 1844, in Darwin's Geol. Obs. Vol. Islands, p. 168.
" " *Idem*, 1845, in Strzelecki's Phys. Descr. N. S. Wales and V. D. Land, p. 268, pl. 9, fig. 3.
" " McCoy, 1847, Ann. Mag. Nat. Hist., xx, p. 226.
" " J. D. Dana, 1847, Geol. Wilkes' U. S. Explor. Exped., p. 710, pl. 11, fig. 1 (fig. 1 excl.) and pl. 10, fig. 2.

The cœnœcium is in the shape of a conical vase with a rim more or less raised and variously folded. It must have been attached to a straight and pointed peduncle; its general appearance decidedly recalls that of many Tertiary and living species of *Retepora*. Just like these the branches of the cœnœcium are so intimately connected that they form one homogeneous tissue, pierced by a large number of oval fenestrules, which, arranged in straight lines, often bifurcate, radiating from the peduncle towards the margin. Unlike *Fenestella* the cells are on the internal surface, and three parallel lines of them, very small and arranged quincuncially, occupy the free space between two rows of fenestrules; two or three small cells like the first border the upper and underside of each fenestrule. Exteriorly the branches are much better defined, owing to the slightly rounded form; their surface is covered with a large number of fine, faintly marked, longitudinal striæ.

Dimensions.—The most perfect specimen at my disposal is only three centimetres high, with a diameter of from five to seven centimetres at its free edges. There are about seven or eight fenestrules in each centimetre of length.

Relations and Differences.—Of all known species, *Protoretepora Halliana*, Prout, is that which is most like this one. It differs only in the less regular arrangement of its cells. The other species have for the most part smaller fenestrules, and a different arrangement of their cells. The specimen which Dana figured on his Plate X, fig. 15, and which he has doubtfully assigned to *F. internata*, Lonsdale, appears to me not to differ from the specimen I have just described.

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(1) [*Vide* R. Etheridge, junr., Geol. and Pal. Q'land, 1892, pp. 221-223. Mr. Etheridge describes the specimen figured in De Koninck's Pl. 8, figs. 5 a—c as *P. ampla*, var. *Woodsii*.—W.S.D.]

(2) [Pl. VIII, fig. 5.—W.S.D.]

Horizon and Localities.—According to McCoy this species is common in the Muree Sandstone, at Bell's Creek and Loder's Creek; Mr. Dana found it at Glendon, and Mr. W. B. Clarke at Stony Creek, in a yellowish-grey, rather friable sandstone, where it is associated with numbers of *P. brachythærus*, Sowerby. Strzelecki found it at Spring Hill, Mount Wellington, and the Eastern Marshes, Tasmania.

Genus—RETEPORA ?—*Lamarck.*

RETEPORA ? LAXA, *L. G. de Koninck.*

Pl. VIII, Fig. 5.[1]

By this name I designate a very large and beautiful species of Bryozoan which will probably become the type of a new genus whenever anyone is fortunate enough to find more perfect specimens than those which have been sent me.

The cœnœcium forms a perfect network composed of slender branches of the same thickness throughout, having no regular direction, and joined together directly, so as to produce large fenestrules, irregularly hexagonal and elongated. Taken as a whole the tissue looks like an elongated conical cup. I decided with ease that the interior surface is smooth, and that the cells are on the exterior surface. But on account of the imperfect state of the specimens I could not see enough of the exterior to enable me to give a complete and perfect description of it. I noticed, however, that it is ornamented with a double row of small alternate cells, placed on the inner edges of the fenestrules, ten or twelve on each side. I think that these two rows of cells are directly adjacent and not separated by a mesial keel as in *Fenestella.*

Dimensions.—The height is six centimetres; the superior diameter four centimetres; and the terminal angle 34°.

Horizon and Localities.—This lovely species, which I can compare to no other, seems not uncommon in a brown, rather ferruginous, phtanite, at Colocolo and Burragood; and it is there associated with *Orthis resupinata,* Martin, and *Orthotetes crenistria,* Phillips.

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[1] [Pl. VIII, fig. 6.—W.S.D.]

Genus—POLYPORA, *McCoy.*

POLYPORA PAPILLATA, *McCoy.*

Pl. VII, Fig. 7.

Polypora papillata, McCoy, 1844, Synop. Carb. Foss. Ireland, p. 206, pl. 29, fig. 1.
" " J. Morris, 1854, Cat. Brit. Foss., p. 107.

The small fragment placed at my disposal, which I consider as belonging to this species, possesses so perfectly the shape and characteristics given it by McCoy, that I cannot believe myself mistaken in its identity. The cœnœcium is composed of parallel branches, rarely bifurcating, the breadth of which equals that of the fenestrules. The fenestrules are oval, slightly elongated or subcircular; the crossbars which give rise to them are thin and arched from the two sides. The porous surface is ornamented with three rows of non-marginated cells, arranged quincuncially. According to McCoy the posterior surface, which I was unable to see, is smooth, except for some small pores placed at the point of origin of most of the crossbars.

Horizon and Localities.—A single specimen of this species, the existence of which in the Carboniferous Limestone of Ireland was first recorded by McCoy, was found by Mr. W. B. Clarke in a dark-grey limestone at Buchan.

Class—**BRACHIOPODA.**

Genus—PRODUCTUS, *Sowerby.*

PRODUCTUS CORA, *A. d'Orbigny.*

Pl. IX, Fig. 1.[1]

Terebratula pecten, G. Fischer de Waldheim, 1809, Not. Foss. Gouv. Moscou, p. 30, pl. 3, fig. 1.
Productus Cora, A. d'Orbigny, 1842, Pal. Voyage l'Amérique mérid., p. 55, pl. 5, fig. 8, 9, et 10.
" " E. de Verneuil, 1847, Bull. Soc. Géol. France, IV (2), p. 736.
" " F. A. Roemer, 1860, Palæontographica, IX, p. 13, pl. 4, fig. 6.
" " R. Davidson, 1866, Quart. Journ. Geol. Soc., XXII, p. 43.

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[1] [*Vide* R. Etheridge, junr., Geol. and Pal. Q'land, 1892, p. 248, pl. 12, fig. 14, pl. 13, fig. 1, pl. 38, fig. 11.—W.S.D.]

***Productus riparius*,**	H. Trautschold, 1867, Bull. Soc. Imp. Nat. Moscou, III, p. 35, pl. 5, fig. 2.
„ *Cora*,	J. W. Dawson, 1868, Acad. Geol., p. 297, fig. 98.
„ „	Shumard, 1854, in Marcy's Explor. Red River of Louisiana, p. 189.
„ *cfr. Cora*,	Fr. Toula, 1869, Sitzung. K. Akad. Wissen. Wien, LIX, p. 441.
„ „	R. Etheridge, 1872, Quart. Journ. Geol. Soc., XXVIII, p. 328, pl. 15, fig. 1 and 2.
„ „	L. G. de Koninck, 1873, Rech. Anim. Foss., Terr. Carb. Belg., II, p. 20, pl. 1, fig. 15.[1]
„ „	D. A. Derby, 1874, Bull. Cornell Univ., I, No. 2, p. 49, pl. 2, fig. 17, and pl. 6, fig. 17.
„ „	Fr. Toula, 1875, Sitzung. K. Akad. Wissen. Wien, LXXI, p. 549.
„ „	H. Trautschold, 1876, Kalkbrüche von Miatchkowa, p. 53, pl. 5, fig. 1.

This species has been so well described and so perfectly figured by a number of Palæontologists that I need not enter into details regarding its distinguishing characteristics. I will merely state that the Australian specimens under my notice belong to a variety usually distinguished by its great size, as may be readily seen in the figure given by me. The small longitudinal ribs, with which the surface of this variety is covered, are generally a trifle thicker and less regular than in the other varieties. In every way these specimens resemble those which I have collected in abundance from the Carboniferous Limestone of Visé, and which I have described and figured in my works.

Dimensions.—One specimen found by Mr. W. B. Clarke is about ten centimetres long by about seven broad.

Horizon and Localities.—As I have elsewhere stated this species is remarkable for its wide geographical distribution; it appears nearly everywhere where there are Carboniferous beds, in Asia, America, Europe, and Australia. It apparently existed before the formation of the first beds of the Carboniferous Limestone, and it continued up to the epoch which saw the deposition of the last beds of the same limestone. It is noteworthy that it reaches its greatest size just when it is on the point of vanishing from among the then living fauna. The Rev. W. B. Clarke found several examples of this *Productus* in a compact brownish-yellow limestone near Tilleghary. Mr. R. Etheridge appears to me to have erred in considering as Devonian the specimens of this species which were sent him by Mr. Daintree, and which were found by that Explorer at Gympie, in Queensland, associated with several other Carboniferous species.

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[1] A complete synonomy of this species will be found here.

PRODUCTUS MAGNUS, *Meek and Worthen.*

Pl. X, Fig. 1.

Productus magnus, Meek and Worthen, 1861, Procs. Acad. Nat. Sc. Philadelphia, p. 142.

„ „ *Idem,* 1868, Geol. Survey Illinois, III, p. 528, pl. 20, fig. 7.

This large and beautiful species is subhemispherical; its hinge line equals or slightly surpasses the transverse diameter of the shell. The ears are nearly rectangular. The ventral valve, subsemi-elliptical in contour, is moderately arched, slightly gibbous, and furnished on the lower two-thirds of its length with a wide but not very deep ventral furrow. The beak is small, only slightly recurved and scarcely projecting at all over the hinge line. The dorsal valve is concave, but the greater part of the visceral region is all but flat, while its marginal part is abruptly curved nearly at a right angle for a part of its length equal to about one-quarter of the whole length of the valve. The test of both these valves is thin in comparison with their size. Their internal structure bears a great resemblance to that of *P. semireticulatus,* Martin, but the muscular impressions are not so well marked as in this last. The internal surface of the recurved part of the dorsal valve is covered with a large number of small punctures, like pin pricks, rather close together. The external surface of both valves is ornamented with numerous longitudinal ribs, rather thin, not very regular, and often bifurcating; on the ventral valve these ribs are interrupted in their course by numerous small tubular spines slightly widened and thickened at their base. A row of similar but more pronounced spines is found along, and at a short distance from, the hinge line of this same ventral valve; these spines correspond to the punctures of the dorsal valve. Some faint concentric lines of growth cross the longitudinal ribs, not always producing a reticulated design like that which so clearly distinguishes *P. semireticulatus* from most of its congeners.

Dimensions.—The following dimensions were taken from a specimen from Illinois, sent to the Brussels Royal Natural History Museum by Mr. Worthen:—length, seven centimetres; breadth, eight centimetres; total thickness, 3.75 centimetres. The only Australian specimen sent me was 4.5 centimetres long, and 5.5 broad.

Relations and Differences.—Before having an opportunity of studying it in nature I had entertained many doubts as to the specific value of this *Productus.* Now I entirely agree with Meek and Worthen, who consider it a perfectly distinct species. *P. giganteus* and *P. semireticulatus*, Martin, most nearly approach this species, and it occupies, so to speak, an intermediate place between them. It resembles the first by its general form, by its great size, and by the row of spines with which the hinge line is covered, but differs from it by the thinness of its test, by the absence of strong muscular impressions, and above all by the absence of the two depressions which give rise to the two large protuberances that characterise the internal moulds of full grown specimens of *P. giganteus;* again, its ears are never turned round like a horn, and its dorsal valve, far from following the contour and curve of the ventral valve, as in *P. giganteus*, deviates from it and is level for the greater part of its length, thus leaving a greater space for the soft parts of the animal. It cannot be confounded with *P. semireticulatus*, of which I formerly considered it a variety, because its ventral valve is never geniculated whatever its size and age; while the visceral part is never completely separated from the anterior part, which is generally very much prolonged in the *P. semireticulatus*, and again the concentric wrinkles, which produce the reticulated appearance in *P. semireticulatus*, making it easily distinguishable from its congeners, are not well marked, and are scarcely noticeable in *P. magnus.*

Horizon and Localities.—This species was found in America, in the lower beds of the Carboniferous Limestone of County Monroe (Illinois), and in County Sainte-Genevieve (Missouri). Mr. W. B. Clarke found a single specimen of it in a brownish brecciated limestone south-east of Buchan.

PRODUCTUS SEMIRETICULATUS, *Martin.*

Pl. IX, Fig. 2.[1]

Conchæ pilosæ,	D. Ure, 1793, Hist. Rutherglen, p. 316, pl. 16, fig. 12.
Anomites semireticulatus,	W. Martin, 1809, Petrif. Derbiensis, p. 7, pl. 31, fig, 1, 2, 3, and pl. 33, fig. 4.
„ *productus,*	*Idem*, 1809, *ibid.*, p. 9, pl. 22, fig. 1, 2, 3.
Productus scoticus,	Sowerby, 1814, Min. Conch., I, pl. 69, fig. 3.
„ *Martini,*	*Idem*, 1821, *ibid.*, IV, p. 15, pl. 309, fig. 230.

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[1] [*Vide* Etheridge, R. Junr., Geol. and Pal. Q'land, 1892, p. 255.—W.S.D.]

Productus hepar ?	S. G. Morton, 1836, Am. Journ. Sci., XXIX, p. 153, pl. 26, fig. 39.
Strophomena antiquata,	Bronn., 1837, Lethæa Geogn., p. 86, pl. 2, fig. 14.
Productus Inca,	A. d'Orbigny, 1844, Pal. Voyage Amérique mérid., p. 51, pl. 4, fig. 2 et 3.
„ *peruvianus,*	*Idem*, 1844, *ibid.*, p. 12, pl. 4. fig. 4.
„ *boliviensis,* „ *Gaudryi,*	*Idem*, 1844, *ibid.*, p. 52, pl. 4, fig. 5, 6, 7, 8, 9.
„ *antiquatus,*	McCoy, 1847, Ann. Mag. Nat. Hist., XX, p. 235.
„ *semireticulatus,*	E. de Verneuil, 1847, Bull. Soc. Géol. France, IV (2), p. 705.
„ *sp. ?*	Christy, 1848, Letters on Geology, pl. 5, fig. 1.
„ *semireticulatus,*	F. Roemer, 1852, In Bronn's Lethæa Geogn., 2 Aufl., p. 378, pl. 2, fig. 14, und pl. 3, fig. 6.
„ *cora,*	D. D. Owen, 1856, Geol. Repts. Iowa, Wisconsin, and Minnesota, p. 103, pl. 5, fig. 1 (non d'Orb).
„ *æquicostatus,*	Shumard, 1855, In Swallow's Ann. Rept. Geol. Survey Missouri, I and II, p. 201, pl. C. fig. 10.
„ *semireticulatus,*	J. Hall, 1856, In W. P. Blake's Rept. Geol. Route Mississipi River to the Pacific Ocean, p. 99, pl. 2, fig. 16, 17.
„ *Ivesii,*	J. S. Newberry, 1861, Ive's Colorado Explor. Exped. Geol. Rept., p. 122, pl. 2. fig. 1–8.
„ *semireticulatus,*	F. Roemer, 1863, Zeits. Deutsch. Geol. Gesell., p. 590, pl. 16, fig. 2.
„ „	T. Davidson, 1866, Quart. Journ. Geol. Soc., XXII, p. 43, pl. 2. fig. 12.
„ *sp. ?*	H. D. Rogers, 1868, Geol. Pennsylvania, II, Pt. 2, p. 833, fig. 687.
„ *semireticulatus,*	J. W. Dawson, 1868, Acad. Geol., p. 297, fig. 97.
„ „	F. Toula, 1869, Sitzung. Akad. Wissens. Wien, LIX, p. 441.
„ „	F. Roemer, 1870, Geol. v. Ober-Schlesien, p. 90.
„ „	L. G. de Koninck, 1873, Rech. Anim. Foss. Terr. Carb. Belg., II, p. 27 (for reference to the rest of the synonyms).
„ „	O. D. Derby, 1874, Bull. Cornell Univ., I, No. 2, p. 47, pl. 4, fig. 8, pl. 6, fig. 18 and pl. 7, fig. 5, 6, 7, 15, 16.
„ „	F. Toula, 1865, Neues Jahrb. fur Min., p. 234, pl. 6, fig. 1.
„ „	*Idem*, 1875, Sitzung. K. Akad. Wissen. Wien, LXXI, p. 550.

This species, the list of synonyms for which can be completed by reference to my Monograph on the genus to which it belongs, or to the second part of my *Recherches sur les Animaux fossiles*, is so well known, and so abundant in Carboniferous rocks that a detailed description of it here seems superfluous. As I have before stated this species is easily recognized by the gibbosity of its ventral valve, and by the concentric folds covering the ears and visceral region of the same valve, crossing at right angles to the longitudinal ribs of the surface, and thus producing a reticulated design very rarely so pronounced in any other species. The dorsal valve is nearly flat in the visceral region, and is recurved at nearly a right angle so as to produce a prolongation which applies itself directly to that of the ventral valve and follows all its curves. This species is rather subject to considerable variation in size; sometimes its prolongations are very short and do not exceed one centimetre in length, while sometimes they reach a length of from seven to eight centimetres, without any modification of the principal part of the shell. Often its longitudinal ribs are smooth or slightly tuberculous; while the surface of some specimens bristles with tubular spines, some as much as six or seven centimetres long. The Australian specimens are of medium size and approach the variety which J. Phillips has figured under the name of *P. pugilis.*

Horizon and Localities.—This species, which is one of the most abundant, the most widespead, and the most characteristic in the Carboniferous rocks of Europe, is rather rare in Australia, in spite of the great development of these rocks there. Five well preserved specimens, all like those from the Belgian Carboniferous rocks, were sent me by the Rev. W. B. Clarke, who found them in a greyish or brownish limestone at Glen William and Colocolo. A sixth comes from the banks of the Williams River, where it was found in a grey, argillaceous limestone, associated with several other species.

PRODUCTUS UNDATUS, *Defrance*.[1]

Pl. IX, Fig. 4.[1]

Productus	*undatus,*	Defrance, 1826, Dict. Sc. Nat., XLIII, p. 354.
„	„	L. G. de Koninck, 1842, Descr. Anim. Foss. Terr. Carb. Belg., p. 156, pl. 12, fig. 2.
„	*tortilis* ?	McCoy, 1844, Synop. Carb. Foss. Ireland, p. 116, pl. 20, fig. 14.
„	*undatus,*	de Verneuil, 1845, Russia and Ural Mts., II, p. 261, pl. 15, fig. 15.
„	„	L. G. de Koninck, 1847, Rech. Anim. Foss., I, p. 59. pl. 5, fig. 3.

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[1] [Pl. XI, fig. 4. *Vide* Etheridge, R. Junr., Geol. and Pal. Q'land, 1892, p. 254, pl. 12, fig. 16.—W.S.D.]

Productus undatus, A. d'Orbigny, 1850, Prodr. Pal., I, p. 141.
„ „ J. Morris, 1850, Cat. Brit. Foss., p. 145.
„ „ M. v. Grünewaldt, 1860 Mém. Acad. Imp. St. Pétersbourg, II (7), p. 116.
„ „ T. Davidson, 1860, Mon. Scottish Carb. Brach., p. 4, fig. 15, 16, 17.
„ „ *Idem*, 1861, Mon. Brit. Carb. Brach., p. 161, pl. 30, fig. 7 and 13.
„ *undatus* ? Toula, 1874, Sitzung. K. Akad. Wissen. Wien, LXX, p. 9.

A shell of moderate size, suborbicular or slightly transverse, seldom longer than broad. The hinge line is generally a little shorter than the transverse diameter. The ventral valve is sub-hemispherical, rather regularly arched, and with no ventral furrow; the beak is small, swollen, recurved, but projecting only a trifle over the hinge line; the ears are small, and nearly rectangular at their extremities; the external surface is entirely covered with thick concentric folds. These folds are angular and arranged terrace-like one under the other; although nearly parallel to each other their direction is not very regular; they are, indeed, usually sinuous, and generally their course is not unbroken; they are crossed perpendicularly by a great number of filiform ribs multiplying themselves by interposition, and occasionally interrupted by a small tubercle, or a small tubular spine. The dorsal valve is concave, and follows, at a little distance, the contour of the ventral valve. Its ornamentation is like that of the ventral valve.

Dimensions.—Its length is from fifteen to thirty-three millimetres, and its thickness seven to twelve millimetres.

Horizon and Localities.—This species is met with rather frequently in the Upper Limestone of Visé, but it seems rare elsewhere. It has been found in England, Ireland, Scotland, Central Russia, and the Ural. Mr. Toula records it with doubt from Spitzbergen; Leichert[1] and Mr. W. B. Clarke found it near the Paterson River, New South Wales, in a brown sandstone.

PRODUCTUS FLEMINGII, *Sowerby*.

Pl. XI, Fig. 3.

Anomiæ echinatæ, D. Ure, 1793, Hist. Rutherglen, p. 315, pl. 15, fig. 3, 4.
Productus Flemingii, J. Sowerby, 1814, Min. Conch., I, p. 154, pl. 68, fig. 2.
„ *longispinus*, *Idem*, 1814, *ibid.*, p. 155, pl. 68, fig. 1.

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[1] [Dr. Ludwig Leichhardt.—W.S.D.]

Productus Flemingii,	L.-G. de Koninck, 1847, Rech. Anim. Foss., I, p. 75, pl. 10, fig. 2.
„ „	T. Davidson, 1861, Mon. Brit. Carb. Brach., p. 154, pl. 35, fig. 5–19.
„ *longispinus,*	F. Roemer, 1863, Zeits. Deutsch. Geol. Gesell., p. 589, pl. 16, fig. 1.
„ „	T. Davidson, 1866, Quart. Journ. Geol. Soc., XXII, p. 43.
„ „	F. Roemer, 1870, Geol. v. Ober-Schlesien, p. 89, pl. 8, fig. 2.
„ „	R. Etheridge, Senr., 1872, Quart. Journ. Geol. Soc., XXVIII, p. 333, pl. 18, fig. 9.
„ *Flemingii,*	L.-G. de Koninck, 1873, Rech. Anim. Foss., II, p. 24, pl. 1, fig. 14. (¹)
„ *longispinus,*	F. B. Meek and A. Worthen, 1873, Geol. Survey Illinois, V, p. 569, pl. 25, fig. 10.
„ „	F. Toula, 1874, Sitzung. K. Akad. Wissen. Wien, LXX, p. 12.
„ „	*Idem*, 1875, Neues Jahrb. Min., p. 252, pl. 8, fig. 8.

This species, the general appearance and shape of which are variable, and the most unlike specimens of which are linked together by numerous intermediate varieties, never reaches a great size. It is generally rather small and usually transverse.

The ventral valve is regularly arched, or divided into two more or less distinct lobes by a ventral furrow, very variable in breadth and depth, and commencing at a short distance from the beak. The beak is small and recurved, rarely projecting over the hinge line. The dorsal valve is more or less concave, and is sometimes nearly flat in those individuals possessing no ventral furrow; while in other specimens it is distinctly lobed. All the specimens sent me by the Rev. W. B. Clarke belong to the first of these varieties. The surfaces of both valves are ornamented with numerous small longitudinal ribs, resembling each other, and multiplying either by simple bifurcation or by intercalation. Over that part of the visceral region nearest the beak are concentric folds, generally more distinct on the ears than on the centre of the shell. The ribs of a large number of the European specimens bristle with tubular spines sometimes several centimetres in length; but none of the Australian specimens under examination have that characteristic.

Dimensions.—A fairly perfect specimen of medium size, measures seventeen millimetres long, by twenty millimetres broad.

(¹) For reference to Synonymy.

Horizon and Localities.—This species, like *P. semireticulatus*, Martin, which it nearly always accompanies, and from which it is occasionally difficult to distinguish it, is very widespread throughout the Carboniferous System, where it is found in all the beds. Recently its presence has been detected by Mr. Toula among the Spitzbergen fossils collected by Dr. Drasch. The Australian specimens come from Buchan, Glen William, Harper's Hill, Burragood, and Colocolo, where they occur in grey or brownish limestone. Mr. McCoy calls attention to its occurrence in a hard black shale at Lewinbrook; and Mr. R. Etheridge, Senior, found it on the banks of the Don, Queensland.

PRODUCTUS PUNCTATUS, *Sowerby*.

Pl. XI, Fig. 2.[1]

Conchæ pilosæ,	Ure, 1793, Hist. Rutherglen, p. 316, pl. 15, fig. 7.
Anomites punctatus,	Martin, 1809, Petrif. Derbiens., p. 8, pl. 37, fig. 6 (fig. 7 and 8 excl.)
Trigonia rugosa,	Parkinson, 1811, Organic Remains, III, p. 177, pl. 12, fig. 11.
Productus punctatus,	Sowerby, 1823, Min. Conch., IV, p. 22, pl. 323.
" "	E. de Verneuil, 1847, Bull. Soc. Géol. France, IV (2), p. 706.
" "	L.-G. de Koninck, 1847, Rech. Anim. Foss., I, p. 123, pl. 12, fig. 2. (2)
" "	Quenstedt, 1852, Handb. Petrefaktenkunde, p. 491.
" "	Shumard, 1854, in R. Marcy's Exploration of the Red River of Louisiana, p. 188, pl. 1, fig. 5, and pl. 2, fig. 1.
" "	M. v. Grünewaldt, 1860, Mém. Acad. Imp. St. Pétersbourg, II (7), p. 125.
" "	H. B. Geinitz, 1866, Carb. u. Dyas in Nebraska, p. 55.
" "	F. Roemer, 1870, Geol. v. Ober-Schlesien, p. 60, pl. 7. fig. 2.
" "	L.-G. de Koninck, 1873, Rech. Anim. Foss., II, p. 30, pl. 1, fig. 19. (3)
" "	F. B. Meek and A. H. Worthen, 1873, Geol. Survey Illinois, V, p. 569, pl. 25, fig. 13.
" "	F. Toula, 1875, Sitzung. K. Akad. Wissen. Wien, LXXXI, p. 549.

This beautiful species, which was one of the first to be described and figured, is one of the easiest to distinguish, and is represented, among the fossils collected by the Rev. W. B. Clarke, only by a fragment, and by a fairly perfect specimen of the dorsal valve. This dorsal valve is, however, very interesting, as it gives exactly an almost complete mould of the internal surface of this valve. It is easily seen from the figure that the shape of this specimen is transversely suboval, and decidedly broader than long. One can see in it, distinctly, superficial traces of the concentric lines of growth, and of numerous small spines which cover the external surface of this species, forming, indeed, its most important characteristic. The impressions of the adductor muscles are also very correctly represented; they are relatively small, shallow, elongated, and dendritic towards their upper end. The reniform impressions are entirely absent; the median plate, serving to strengthen and support the cardinal process, is relatively thin, but occupies nearly two-thirds of the length of the valve. The cardinal process is strong and trilobed. It must be noted that on the ears and surrounding parts traces of concentric rings are completely effaced, and in their place is a subtriangular surface covered with minute granulations; this probably proves that the shell was thicker here than in the rest of the valve, the traces of ornamentation being more completely effaced.

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[1] [Pl. 10, fig. 2.—W.S.D.]
[2] For reference to Synonymy.
[3] *Ibidem.*

Dimensions.—The length of the specimen here described is about four centimetres, and its breadth 5·5 centimetres.

Horizon and Localities.—This species is very abundant in the upper beds of the Carboniferous Limestone, less frequent in the middle beds, and apparently absent in the lower beds. This is probably why it is so rare in the Carboniferous rocks of America, where the lower beds are much better represented and more developed than elsewhere. It was found, for the first time in Australia, by the Rev. W. B. Clarke, in a brown phtanite at Buchan, on the banks of the Gloucester River, and in a grey limestone on the banks of the Karua and Williams Rivers.

PRODUCTUS FIMBRIATUS, *Sowerby*.[1]

Pl. XI, Fig. 5.

Productus fimbriatus, J. de Carle Sowerby, 1823, Min. Conch., V, p. 85, pl. 459, fig. 1.
„ „ L.-G. de Koninck, 1847, Rech. Anim. Foss., I, p. 127, pl. 12, fig. 3.
„ „ Quenstedt, 1852, Handb. Petrefaktenkunde, p. 491.
„ „ Davidson, 1861, Mon. Brit. Carb. Brach., p. 171, pl. 33, fig. 12 and 13, and pl. 44, fig. 15.
„ „ L.-G. de Koninck, 1873, Rech. Anim. Foss., II, p. 82, pl. 1, fig. 18.

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[1] [*Productus* cf. *fimbriatus*. R. Etheridge, Junr., Geol. and Pal. Q'land., 1892, p. 255, t. 12, f. 15.—W.S.D.]

Adult individuals of this species are usually longer than broad, while young individuals are usually broader than long. In spite of this difference this species is not difficult to identify, if care be taken to collect a sufficient number of specimens showing the almost insensible modifications of the shell in its various stages of growth. Again, the concentric folds, which ornament the surface and sometimes become true ridges of growth, render it impossible to confound this species with *P. punctatus*, which is the only one to which it has some resemblance; then again it never reaches the size of *P. punctatus*; and finally, the concentric bands of *P. punctatus* are always flat, and covered with much more numerous and slender spines and tubercles.

Dimensions.—The two specimens sent me are only six millimetres long by seven broad.

Horizon and Localities.—This species is more frequent in the Upper Carboniferous beds than elsewhere. It is not uncommon at Visé, nor in the neighbourhood of Glasgow. One of the specimens sent me by the Rev. W. B. Clarke was found by him in a grey sandstone slightly tinged with yellow, near Tilleghary; and the other in a dark grey limestone on the banks of the Karua and Williams Rivers.

PRODUCTUS SCABRICULUS, *Martin*.

Conchyliolithus anomites scabriculus, Martin, 1809, Petrif. Derbiensis, p. 8, pl. 36, fig. 5.

Productus scabriculus,	Sowerby, 1814, Min. Conch., p. 157, pl. 69, fig. 1.
„ „	Defrance, 1826, Dict. Sci. Nat., XLIII, p. 350.
„ „	Fleming, 1828, British Animals, p. 378.
„ „	Keferstein, 1834, Naturgesichte des Erdköpers, p. 666.
„ „	Deshayes in Lamarck, Animaux sans Vertebres, VI, p. 383.
„ „	J. Phillips, 1836, Geol. Yorkshire, II, p. 214, pl. 8, fig. 2 and 20.
„ *quincuncialis*,	*Idem*, 1836, *ibid.*, p. 214, pl. 7, fig. 8.
Leptæna scabricula,	Fischer de Waldheim, 1837, Oryct. Gouv. Moscou, p. 142.
Productus scabriculus,	Desor, 1840, Traduction de la Conch. Min. de Sowerby, p. 106, pl. 51, fig. 1 and 2.
„ *antiquatus*,	Von Buch, 1841, Abhandl. K. Akad. Wissen. Berlin, I, p. 29 (non Martin).

Productus scabriculus,	L. G. de Koninck, 1843, Descr. Anim. Foss. Terr. Carb. Belg., p. 190, pl. 11, fig. 3.
Leptæna scabricula,	Farenkohl, 1844, Bull. Soc. Imp. Nat. Moscou, XVI, p. 784.
Producta „	McCoy, 1844, Synop. Carb. Limestone Foss. Ireland, p. 114.
„ *quincuncialis,*	*Idem*, 1844, *ibid.*, p. 114.
Productus corbis,	Potiez and Michaud, 1844, Gall. Moll. Musée de Douai, II, p. 26, pl. 41, fig. 2.
„ *scabriculus,*	E. de Verneuil, 1845, In Murchison, de Verneuil and Keyserling, Russia and the Ural Mts., II, p. 271, pl. 16, fig. 5, and pl. 18, fig. 5.
„ *pustulosus ?*	*Idem*, 1845, *ibid.*, p. 276, pl. 16, fig. 11 (non Phillips).
„ „	L. G. de Koninck, 1847, Mém. Soc. R. Sci. Liége, IV, p. 114, pl. 11, fig. 7.
„ „	*Idem*, 1847, Rech. Anim. Foss., I, p. 10, pl. 11, fig. 6.
„ *scabriculus,*	McCoy, 1847, Ann. Mag. Nat. Hist., XX (1), p. 235.
„ „	P. v. Semenow, 1854, Ueber Foss. Schlesischen Kohlenkalk, p. 41.
„ „	J. Morris, 1854, Cat. Brit. Foss., p. 145.
„ *Rogersii,*	Norwood and Pratten, 1854, Journ. Acad. Nat. Sci. Philadelphia, III, p. 9, pl. 1, fig. 3.
„ *Neffedievi,*	De Keyserling, 1854, In Schrenck, Reise nach dem Nordosten des Europ. Russlands, II, p. 93.
„ „	J. Hall, 1856, In Blake's Rept. Pacific Railroad Explor., p. 104, pl. 2, fig. 14, 15.
„ *scabriculus,*	J. Marcou, 1858, Geol. N. Am., p. 47, pl. 5, fig. 6.
„ *asperus,*	J. H. McChesney, 1858, Descr. New Sp. Foss. Pal. Rocks Western States, p. 34, pl. 1, fig. 7.
„ *symmetricus ?*	*Idem*, 1858, *ibid.*, p. 35, pl. 1, fig. 9.
„ *Wilberanus,*	*Idem*, 1858, *ibid.*, p. 36, pl. 1, fig. 8.
„ *scabriculus,*	T. Davidson, 1860, Mon. Carb. Brach. Scotland, p. 42, pl. 4, fig. 18.
„ „	E. d'Eichwald, 1860, Lethæa Rossica, I. p. 891.
„ „	T. Davidson, 1866, Quart. Journ. Geol. Soc., XXII, p. 42, pl. 2, fig. 13.
„ „	H. B. Geinitz, 1866, Carb. u. Dyas in Nebraska, p. 54.
„ *pustulosus,*	*Idem*, 1866, *ibid.*, p. 55.

Strophalosia horrescens,	*Idem*, 1866, *ibid.*, p. 81 (non. de Verneuil).
Productus scabriculus,	J. Armstrong, 1871, Trans. Geol. Soc. Glasgow, III, suppl., p. 40.
,, ***symmetricus,***	F. B. Meek, 1852, Rept. Pal. East. Nebraska, p. 167, pl. 5, fig. 6 (pl. 8, fig. 13 exclusâ).
,, ***nebrascensis,***	*Idem*, 1872, *ibid.*, p. 165, pl. 2, fig. 2. pl. 4, fig. 6, and pl. 5, fig. 11.

This shell is usually a trifle longer than broad, the young individuals are generally sub-circular, and the adults nearly rectangular; in the latter case the margins are slightly curved, and sub-parallel. The ventral valve is strongly ventricose, depressed in its median part, and usually furnished with a very broad, shallow, ventral furrow. The beak is pointed, although tumid at a short distance from its extremity, recurved and rather prominent. The hinge line is straight, and rarely as long as the transverse diameter of the shell; the ears are small, and terminate in an acute angle. The whole external surface is covered with longitudinal ribs, remarkable for the alternate elevations and depressions they exhibit, transforming them into tubercles disposed rather irregularly in a quincunx, and frequently ornamented with small curved spines. The dorsal valve is slightly concave, and usually furnished with a broad dorsal ridge corresponding to the ventral furrow, but the tubercles are here replaced by punctures of the same shape. The surface of both valves is generally crossed by concentric undulations, better marked on the ears than elsewhere.

Dimensions.—This species can acquire rather large dimensions, and it is not unusual to find them six or seven centimetres long. The only specimen found by Mr. W. B. Clarke is twenty-three millimetres long by twenty-two broad.

Relations and Differences.—This species has been figured under divers names, according to the greater or less perfect state of its preservation. After inspecting the original specimens, I am sure that most of the varieties named in the list of synonyms of this species depend merely upon the differences in the kind of rocks in which they have been preserved, and on the greater or less ease with which they have been separated from it.

Horizon and Localities.—This *Productus* is not uncommon in the Upper and Middle Series of the Carboniferous Limestone. It occupies a horizontal position of great extent, being found abundantly in Europe, where the

Carboniferous Limestone comes to light, and also in Asia, America, the Ural, and Australia. It seems to be rather rare in Australia, as Mr. W. B. Clarke has found only one specimen of it on the banks of the Williams, associated with *Spirifera duplicicosta*, Phillips.

PRODUCTUS BRACHYTHÆRUS, *G. Sowerby.*[1]

Pl. X, Fig. 4, and Pl. IX, Fig. 1.[2]

Productus	***brachythærus,***	G. Sowerby, 1844, In Darwin's Geol. Obs. Volc. Islands, p. 158.
„	„	J. Morris, 1845, In Strzelecki's Phys. Descr. N. S. Wales and V. D. Land, p. 284, pl. 14, fig. 4*c* (fig. 4*a* and 4*b* exclusis).
„	„	F. McCoy, 1847, Ann. Mag. Nat. Hist., XX, p. 235.
„	***undulatus,***	*Idem*, 1847, *ibid.*, p. 236, pl. 13, fig. 2.
„	***brachythærus,***	L. G. de Koninck, 1847, Rech. Anim. Foss., I, p. 102, pl. 16, fig. 1*a*, 1*b* (fig. 1*c* and 1*d* exclusis).
„	„	J. Dana, 1849, Geol. Wilkes' U. S. Explor. Exped., p. 686, pl. 2, fig. 8.

This shell is of moderate size, inflated, slightly transverse, and subtrapezoidal in contour. The ventral valve is gibbous, with abrupt sides, slightly depressed in its median portion, but having no well-marked ventral furrow. Its outer surface is ornamented with a great number of very small longitudinal ribs, giving rise to acicular tubes seldom well preserved; these tubes, having their origin at some distance from the point where they cross the shell in order to leave it, produce on the surface small elongated tubercles, the anterior extremities of which are pierced when the tubes have disappeared. The ears are short, rather wide, and supplied with a row of five or six nearly vertical tubular spines, with rounded bases, parallel to the hinge line. The beak is tumid, short, scarcely projecting over the hinge line, which is straight, and shorter than the transverse diameter of the valve. Near the beak there are generally some faint traces of concentric wrinkles. I have had an opportunity of observing the interior structure of this valve on several well-preserved moulds, and it is quite different from that which Mr. J. Morris has attributed to it from a mould which he believes to have been produced by it, but which really belongs to another species, as I suspected as long ago as 1847. The test being very thin, the shell could not possibly receive the strong muscular impressions which ornament the mould represented by the learned English Palæontologist; its muscular impressions are, on the contrary, very superficial on all the moulds which I think are those of shells belonging to *P. brachythærus*, as it has been defined and described by Sowerby. Those of the adductor muscles are narrow, and consist of a few oblique ramifications; the points of attachment for the cardinal muscles must have been very faintly marked, since they have left no trace at all. The rest of the internal surface shows some traces of elongated spiny tubercles which ornament the outer surface. The dorsal valve, of which I have examined two specimens, is nearly flat in the visceral region, while its prolongation is recurved abruptly, and, fitting itself to the ventral valve, follows its trend up to the margins. Its external ornamentation consists of fine ribs like those of the ventral valve, with this difference, that, in place of some of the tubercles of the latter, there are punctures, elongated or rounded, according to their position; and it is chiefly the marginal regions which bristle with spiniform, rather thick and long, tubes, irregularly inserted. The concentric ridges are rather more apparent on the dorsal than on the ventral valve. The cardinal process is very small, and composed only of a trilobed tooth, not well marked. I could find no trace of a septum, or of muscular or vascular impressions, on the inner surface.

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[1] [*Vide* R. Etheridge, Junr., Geol. and Pal. Q'land, 1892, p. 248 *et seq.*, t. 12, f. 10–13, t. 13, f. 5 (?), t. 44, f. 14.—W.S.D.]

[2] [Pl. 11, fig. 1.—W.S.D.]

Dimensions.—The average length of the specimens sent me is thirty-five millimetres; the breadth, thirty-one millimetres; and the thickness, twenty millimetres.

Relations and Differences.—This species bears a great resemblance to *P. scabriculus*, Sowerby, and *P. rugatus*, Phillips. It differs from the former by being much more gibbous, and by the length of its prolongations; and from the latter by this last characteristic, but especially by its longitudinal ribs, and its surface ornamentation of elongated tubercles. I am inclined to believe that Fig. 3, Pl. XV of the Memoir by Mr. R. Etheridge on the fossils of Queensland,[1] represents only the dorsal valve of a young individual of this species; but I dare not affirm this without having seen the actual specimen figured by the learned Palæontologist of the School of Mines, London.

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[1] Quart. Journ. Geol. Soc., XXVIII, 1872.

Horizon and Localities.—This species is not rare in Australia, but it is not easy to procure well-preserved specimens of it. According to McCoy, it is very abundant in the calcareous sandstone at Loder's Creek and Korinda; Dana says it occurs at Wollongong Point and Illawarra. Strzelecki found it at Mount Wellington, Tasmania; and Mr. Clarke at Raymond Terrace, at the junction of the Hunter and Williams Rivers, and at Ællalong, on the road from Crawford's Creek to Watagan Creek; and at Darlington, where it is contained in a yellowish-grey, rather friable, calcareous sandstone. It has also been found at Muree and Morpeth, in a grey compact limestone, in which the substance of its shell, which is nacreous and iridescent, is preserved.

PRODUCTUS FRAGILIS, *J. Dana.*[1]

Pl. X, Fig. 3.

Productus fragilis, J. Dana, 1849, Geol. Wilkes' U. S. Explor. Exped., p. 686, pl. 2, fig. 7.

This shell is subrectangular, transverse, and a little broader than long. The ventral valve is deep, with prominent, more or less geniculated and prolonged, margins; the dorsal part is slightly sinuous; the hinge line is as long as the transverse diameter; the ears are depressed at their extremities; the hinge line forms a right angle with the lateral margins; the beak is small, slightly recurved, and only very slightly projecting over the hinge line. The external ornamentation consists of a great number of fine longitudinal striæ crossed by faint concentric undulations. The small ribs produced by these striæ do not appear to be spiny. The muscular impressions are rather close to the beak, and are very shallow; those of the cardinal muscles are very narrow, and form irregular ramifications, while those of the adductor muscles are relatively broad and composed of a great number of parallel furrows with a longitudinal direction, and only very slightly passing below the lower limit of the cardinal impressions. On account of the extreme thinness of the shell the rest of the internal surface is covered with striæ similar to those of the exterior, with this difference, that towards the margins they are riddled for some distance by small punctures like pin-pricks. The dorsal valve is slightly concave, and consequently leaves a relatively small space between itself and the ventral valve. Its shell seems to have been a little thicker than that of the ventral valve, its interior surface showing no trace of the exterior ornamentation. Its interior surface, which I have studied from an exceptionally good mould (Pl. X, Fig. 3), is remarkable for the following characteristics:—Its median septum, occupying rather more than a half of the whole length of the valve, is relatively strong, and grooved by a furrow for nearly its whole length; its hinge line is thickened, and its cardinal process terminates in a four-lobed projection which penetrates the beak. The impressions of the adductor muscles are not very extensive, but are formed of several ramifications projecting from the lower part and meeting the reniform vascular impressions, the surface of which is covered with fine undulating striæ sub-parallel to the frontal margin. The rest of the surface, except the extremities of the ears, is entirely covered with very small punctures like pin-pricks, and closely packed together.

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[1] [Mr. R. Etheridge, Junr., considers this form to be synonymous with *Productus brachythærus*, G. Sby. Geol. and Pal. Q'land, 1892, p. 251.—W.S.D.]

Dimensions.—The length equals three centimetres, and the breadth 3·3 centimetres.

Relations and Differences.—This species is easily distinguished from the preceding by the extent of its hinge-area, by the convexity of its dorsal valve, and by the prominence of its vascular and muscular processes. It is not impossible that the casts figured by Mr. J. Morris under the name *P. brachythærus* (in Count Strzelecki's work, Pl. XIV, Figs. 4^a and 4^b), belong to this species, although the high relief produced on the casts by the muscular impressions of the ventral valve, make me doubtful; yet in comparing these figures with those I have given on Pl. X, Fig. 3, the strong likeness between them will at once appear.

Horizon and Localities.—Mr. Dana found this species at Wollongong Point and Illawarra. The only specimen sent me by Mr. W. B. Clarke came from Branxton.

PRODUCTUS CLARKEI, *R. Etheridge.*[1]

Pl. X, Fig. 2.[2]

Productus Clarkei, R. Etheridge, Senr., 1872, Quart. Journ. Geol. Soc., XXVIII, p. 334, pl. 17, fig. 2.

The shell is sub-circular, nearly as broad as long; the hinge line is very little developed; the ears are small and slightly angular. The ventral valve is subhemispherical, regularly arched, and not depressed in its median part; the beak is small, and not prominent. The exterior ornamentation consists of a large number of small, elongated, rather thin, tubercles, regularly arranged in a quincunx, having probably given rise to tubular spines. According to Mr. Etheridge the dorsal valve is nearly flat, its surface shows traces of tubercles and spines, and it is also ornamented with concentric rings of growth. I have had no opportunity of observing an actual specimen.

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[1] [*Strophalosia Clarkei.* R. Etheridge, Junr., Proca. R. Phys. Soc. Edinb., 1880, v, p. 289, t. 9, f. 18*a*–21, t. 10, f. 22–28, t. 11, f. 29–31, t. 12, f. 32–33; Geol. and Pal. Q'land, 1892, p. 258, t. 13, f. 12–17, t. 14, f. 19. See also A. H. Foord, Geol. Mag., 1890, VII (3), p. 103.—W.S.D.]

[2] [Pl. X, Fig. 5.—W.S.D.]

Dimensions.—One rather well-preserved specimen was thirty-one millimetres long by thirty-five broad; another specimen was 4·5 centimetres long by five centimetres broad.

Relations and Differences.—This species is closely allied to *P. muricatus*, Phillips; it differs from it by its much greater size, by the more regular arrangement of its tubercles, and by being less elongated. It must not be confounded with *P. Clarkianus*, Derby, which is quite another species.

Horizon and Localities.—Mr. Daintree found this species on the banks of the Bowen River, Queensland; and Mr. W. B. Clarke, to whom it has been dedicated, found it in a greyish limestone at Branxton, and in a brownish calcareous conglomerate at Burragood, on the Paterson River, in New South Wales.

PRODUCTUS ACULEATUS, *Martin*.

Pl. XI, Fig. 6.

Anomites	*aculeatus*,	Martin, 1809, Petrif. Derbiensis, p. 1, pl. 39, fig. 9 and 10 (non Schloth).
Productus	„	Sowerby, 1814, Min. Conch., I, p. 156, pl. 68, fig. 4.
„	„	L. G. de Koninck, 1847, Rech. Anim. Foss., I, p. 144, pl. 16, fig. 6.
„	„	M. v. Grünewaldt, 1860, Mém. Acad. Imp. St. Pétersbourg, II (7), p. 125.
„	„	T. Davidson, 1861, Mon. Brit. Carb. Brach., p. 166, pl. 33, fig. 16-20.
„	*Youngianus*,	*Idem*, 1861, *ibid.*, p. 167, pl. 33, fig. 21-23.
„	*aculeatus*,	L. G. de Koninck, 1872, Rech. Anim. Foss., II, p. 35, pl. 1, fig. 20.
„	„	F. Toula, 1875, Sitzung. K. Akad. Wissen. Wien, LXXI, p. 552, pl. 2, fig. 10.

This shell is of medium size, suboval or rounded in contour; its ears are small, and readily fall off; its shell is thin, nacreous, and iridescent; its hinge line is straight, and never as long as the transverse diameter. The ventral valve is regularly arched, not sinuous, and generally rather longer than broad; its beak is small, and barely projects over the hinge line; the exterior surface is irregularly covered with elongated tubercles serving as bases for short tubular spines; by their elongation these tubercles often transform themselves into true, longitudinal, irregular, rugose ribs. The dorsal valve is very concave, and approaches very near to the ventral valve, following its contour, and having its ornamentation as a cast.

Dimensions.—The three Australian specimens under my examination average only ten millimetres long by eight broad. One belongs to the variety figured by me under the name *P. gryphoïdes* (*P. Youngianus* of Mr. T. Davidson), and the two others to the type described by Martin.

Horizon and Localities.—This species is very widespread in the Carboniferous Limestone, and it is always more abundant in the upper than in the other beds. Mr. Toula has lately seen it among the fossils from Höfer, one of the Barent Isles. Mr. W. B. Clarke found it at Colocolo, and also at Pallal, on the Gwydir River.

Genus—CHONETES, *G. Fischer de Waldheim.*

CHONETES PAPILIONACEA, *J. Phillips.*

Pl. X, Fig. 6.

Pectinites flabelliformis,	Lister, 1688, Hist. Conchyl., III, pl. 473, fig. 31.
Productus latissimus,	Dillwyn, 1823, Index to the Hist. Conch. of Lister, p. 24 (non Sowerby).
Spirifera papilionacea,	J. Phillips, 1836, Geol. Yorkshire, II, p. 221, pl. 11, fig. 6.
Chonetes „	L. G. de Koninck, 1843, Descr. Anim. Foss. Terr. Carb. Belg., p. 212, pl. 13, fig. 5, and pl. 13 bis, fig. 1.
Delthyris „	A. Fahrenkohl, 1844, Bull. Soc. Imp. Nat. Moscou, XVII, p. 788.
Orthis „	McCoy, 1844, Synop. Foss. Ireland, p. 125.
Leptæna multidentata,	*Idem*, 1844, *ibid.*, p. 120, pl. 20, fig. 8.
„ ***papyracea ?***	*Idem*, 1844, *ibid.*, p. 120, pl. 20, fig. 2.
Chonetes „	E. de Verneuil, 1845, In Murchison, de Verneuil and de Keyserling, Russia and the Ural Mts., II, p. 241.

Chonetes? variolaris,	De Keyserling, 1846, Reise in das Petschoraland, p. 215, pl. 6, fig. 2.
Chonetes papilionacea,	L. G. de Koninck, 1847, Rech. Anim. Foss., I, p. 187, pl. 19. fig. 2.
,, ,,	P. v. Semenow, 1854, Ueber Foss. Brach. Schles. Kohlenkalkes, p. 30, pl. 1, fig. 2.
,, ,,	McCoy, 1855, Brit. Pal. Foss., p. 455.
,, *papilionaceus,*	E. d'Eichwald, 1860, Lethæa Rossica, I, p. 876.
,, *papilionacea,*	M. v. Grünewaldt, 1860, Mém. Acad. Imp. Pétersbourg, II (7), p. 110.
,, ,,	T. Davidson, 1861, Mon. Brit. Carb. Brach., p. 182, pl. 46, fig. 3–6.

This shell is transverse, sub-circular, depressed, very slightly vaulted, and, indeed, occasionally almost quite flat; its hinge line is straight, occupying the greatest width of the shell. The ventral valve is slightly convex, especially in the median portion; its beak is scarcely perceptible, and not prominent; its hinge area is well developed, and provided with a deltoidal fissure partly covered by a pseudodeltidium. The dorsal valve is slightly concave, and follows, at a short distance, the curves of the ventral valve; its hinge area is narrower than that of the ventral[1] valve, and its rather well-developed cardinal process partly closes the deltoidal fissure of that valve. The exterior surface of both valves is covered with innumerable fine radiating ribs, the thickness of which scarcely varies throughout their whole length; they multiply by simple bifurcation. When the shell, which is very thin, is partly removed, what remains of the ribs is granulated, and seems to bristle with numerous rather pointed tubercles, beside which are small punctures like pin-pricks, due to the perforation of the shell. The hinge line of the ventral valve is furnished with a series of small tuberculate spines, about one millimetre apart. The internal structure of the valves is only known to me in part, but the dotted striæ, observable in most specimens of *Chonetes*, are strongly marked.

Dimensions.—This species can acquire very great dimensions, and reach a breadth of from twelve to fifteen centimetres. An almost perfect specimen, sent me by Mr. W. B. Clarke, measures thirty-three millimetres broad by seventeen long.

Relations and Differences.—This species, in its size, approaches *C. comoïdes*, Sowerby, but differs from it by being nearly flat, and by the slight development of its hinge area. Young individuals resemble *C. dalmaniania*, L. G. de Koninck, but can be distinguished from it by being relatively less elongated, by the angles of its ears, and by the different number of ribs in a given space.[1]

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[1] [The text has "dorsal" here, but "ventral" is obviously intended.—T.W.E.D.]

Horizon and Localities.—Chonetes papilionacea, Phillips, belongs exclusively to the upper beds of the Carboniferous System. It is rather common in the Chokier Limestone, but rare in that of Visé. Mr. Julien found it in the slate quarries of the valley of Sichon, near Vichy. I have a beautiful specimen of it from Karowa, Province of Kalouga, near Moscow. J. Phillips found it at Bolland and Settle, Yorkshire. It occurs near Dublin, and in other localities in Ireland and England, and at Sablé, France. Mr. W. B. Clarke found it at Dungog, on the Williams River, in a grey oolitic limestone, composed of innumerable small black grains in a clear grey base.

CHONETES LAGUESSIANA, *L. G. de Koninck.*[2]

Pl. X, Fig. 7.

Pecten,	D. Ure, 1793, Hist. Rutherglen, p. 317, pl. 16, fig. 10, 11.
Chonetes laguessiana,	L. G. de Koninck, 1843, Descr. Anim. Foss. Terr. Carb. Belg., p. 211, pl. 12 bis, fig. 4.
„ ***hardrensis,***	T. Davidson, 1861, Mon. Brit. Carb. Brach., p. 186, pl. 47, fig. 12–18 (not Phillips).
„ ***cracowensis,***	R. Etheridge, 1872, Quart. Journ. Geol. Soc., XXVIII, p. 336, pl. 18, fig. 2.
„ ***laguessiana,***	L. G. de Koninck, 1878, Rech. Anim. Foss., II, p. 39, pl. 2, fig. 2[3].

My description of this fossil, published in 1872, gives its characteristics so clearly that I will not repeat them here, nor my reasons for considering it essentially different from the Devonian species figured by J. Phillips under the name *C. hardrensis*. I must say that my recent fresh examination of the fossil has confirmed me in my opinion. I am also convinced that the *C. cracowensis* of Mr. R. Etheridge differs in no essential point from my *C. laguessiana*, but is identical with it.

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[1] Mr. McCoy errs in making me state that these differences exist between *C. comoïdes* and *C. papilionacea*. He has confounded page 294 in my Monographie des Chonetes with page 292, as he can easily see by reference to it.

[2] A complete Synonymy and detailed description are given in this work.

[3] [Mr. R. Etheridge, Junr., considers that the Queensland *C. cracowensis* here placed under *C. laguessiana* is a distinct species. Geol. & Pal. Q'land, 1892, p. 262, t. 13, f. 9. This confirms Waagen's opinion, Salt Range Fossils (Pal. Indica), 1891, IV, Pt. 2, p. 132.—W.S.D.]

Dimensions.—The average dimensions of the specimens sent me by Mr. W. B. Clarke are these—nine millimetres long by sixteen millimetres broad. The number of longitudinal ribs is about ninety.

Horizon and Localities.—This species is not uncommon in the upper beds of the Carboniferous Limestone at Visé; and near Glasgow, in Scotland; near Cork, in Ireland; and near Settle, in Yorkshire. Mr. Etheridge cites it as abundant at Cracow, Queensland; and Mr. W. B. Clarke found it in a brownish-grey limestone at Burragood, on the Paterson; Pallal, on the Gwydir; and between the Karua and Dungog, New South Wales.

Genus—STROPHOMENES, *Rafinesque.*

STROPHOMENES ANALOGA, *J. Phillips.*[1]

Pl. IX, Fig. 3, and Pl. XI, Fig. 7.

Producta analoga,	J. Phillips, 1836, Geol. Yorkshire, II, p. 215, pl. 7, fig. 10.
Leptæna angosa,	Fischer de Waldheim, Oryct. Moscou, p. 143 (non Dalman).
,, *distorta,*	J. Sowerby, 1840, Min. Conch., VII, pl. 615, fig. 2.
Orthis analoga,	Portlock, 1843, Rept. Geol. Londonderry, p. 457.
Leptæna depressa,	L. G. de Koninck, 1843, Descr. Anim. Foss. Terr. Carb. Belg., p. 215, pl. 12, fig. 3 (non Sowerby).
Leptagonia analoga,	McCoy, 1844, Synop. Carb. Foss. Ireland, p. 117.
,, *depressa,*	*Idem*, 1844, *ibid.*, p. 117.
,, *multirugata,*	*Idem*, 1844, *ibid.*, p. 117, pl. 18, fig. 12.
Leptæna depressa (partim),	Bronn, 1848, Nomenclator Pal., p. 635 (non Sowerby).
Strophomena depressa,	A. d'Orbigny, 1850, Prod. Pal., I, p. 145.
Leptæna analoga,	J. Morris, 1854, Cat. Brit. Foss., p. 136.
,, *depressa,*	*Idem*, 1854, *ibid.*, p. 137 (non Sow.).
,, *distorta,*	*Idem*, 1854, *ibid.*, p. 137.
Leptagonia analoga,	McCoy, 1855, Brit. Pal. Foss., p. 453.
,, *distorta,*	*Idem*, 1855, *ibid.*, p. 453.
,, *multirugata,*	*Idem*, 1855, *ibid.*, p. 453.

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[1] [See also *Strophomena rhomboidalis*, var. *analoga*, R. Etheridge, Junr., Geol. & Pal. Q'land, 1892, p. 245, t. 12, f. 8, 9, t. 40, f. 6.—W.S.D.]

Strophomena rhomboidalis, var. *analoga*, T. Davidson, 1860, Mon. Carb. Brach. Scotland, p. 31, pl. 1, fig. 26–33 (non Wilckens).
" " var. *analoga*, *Idem*, 1861, Geologist, IV, p. 47 (non Wilckens).
" " var. *analoga*, *Idem*, 1861, Mon. Brit. Carb. Brach., p. 119, pl. 28, fig. 1, 2 (non Wilckens).
" *analoga*, J. W. Dawson, 1868, Acad. Geol., p. 296, fig. 95.
" *rhomboidalis*, var. *analoga*, R. Etheridge, 1872, Quart. Journ. Geol. Soc., XXVIII, pp. 331 and 333, pl. 15, fig. 3, and pl. 16, fig. 7.
" *depressa*, F. Toula, 1874, Sitzung. K. Akad. Wissen. Wien, LXXI, p. 548, pl. 2, fig. 8 (non Sow.).

This shell is usually sub-trapezoidal, sometimes a little irregular, broader than long; the valves are geniculated; the hinge line is straight, occupying the greatest breadth of the shell; its ears are generally depressed, with rounded extremities, extending beyond the lateral margins to which they are joined by a regular curve. The ventral valve is slightly ventricose near the beak, while the rest of its reticulated surface is nearly flat; its surface is ornamented with concentric folds, varying in number and extent, according to the age of the individual. Starting from the last of these folds, the shell recurves on itself at nearly a right angle, prolonging itself for a greater or less distance in this new direction. The concentric folds over the visceral region are not always regular, but frequently interrupted or wavy. In adult specimens the last formed concentric folds are curved outwards as they approach the hinge line, and form with it an acute angle; while the first formed (*i.e.*, those in the centre of the valve) generally meet the hinge line at a right angle. The whole external surface is ornamented with fine radiating ribs, crossing the concentric folds at right angles. The beak is small, not recurved, often perforated, in young individuals, by a circular opening, which completely disappears in the adult. The dorsal valve is slightly concave in the visceral region, where it is some distance from the ventral valve, while the geniculated part approaches it, and follows all its curves. The external ornamentation is like that of the ventral valve. I think I may dispense with a description of the internal structure of the valve, because it has been so perfectly described and figured by Mr. Davidson, and because Pl. IX, Figs. 3*a* and 3*b*, represent that of the Australian specimens.

Dimensions.—The dimensions of this species are very variable. The largest specimen sent by Mr. W. B. Clarke is five centimetres broad by three long.

Relations and Differences.—This *Strophomenes* belongs to a small number of Carboniferous species, the shells of which are so very like some Silurian species that most Palæontologists have thought, with a good deal of reason, that they were produced by the same animal, which had survived all the convulsions to which the Palæozic System had been subjected. The supporters of this opinion, which I also held in 1842, but now believe to be erroneous, explain the constant characteristic differences which exist between the Silurian and Carboniferous species, by the differences in the conditions under which they lived and were developed. I must admit that this explanation does not satisfy me now, because, in comparing a large number of Silurian specimens from divers countries, from rocks of very varied nature, the development of which must necessarily have taken place under the most unlike conditions, I have not found any well-marked difference, but it has always been easy to refer them quickly to their type. The same observation applies to a large collection of Carboniferous specimens which, with the least care, could never be confounded with their Silurian relatives. The chief differences that have always struck me are these:—First, the much greater development of the visceral or reticulated part in the *S. analoga*, and its relatively greater thickness; secondly, the shape of the vascular and muscular processes of the two valves. The muscular process also of the ventral valve of *S. analoga* never has the cordiform appearance which is evident in the corresponding valve of *S. rhomboidalis*, and this last never shows any trace of the numerous vascular branches frequently seen on the internal casts of *S. analoga*, and which have been perfectly figured by Mr. T. Davidson (1). The muscular process of the dorsal valve is not less different in the two species; in *S. analoga* it is narrower, and the principal impressions of the adductor muscles in it are less developed, and, above all, much less rounded than the corresponding ones in *S. rhomboidalis*. I grant that these characteristics are not always easily seen, and that it is necessary to examine a great number of exceptionally well-preserved specimens in order to grasp them; but that is not the point: that these characteristics are constant for both forms is enough to convince me that they are different species. Perhaps I shall soon have occasion to treat this subject afresh, in which event, being supplied with numerous and beautiful specimens, I shall figure and describe them with the utmost care.

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(1) Mon. Carb. Brach., pl. 28, fig. 9, 10, 11.

Horizon and Localities.—This species, found in the Carboniferous System proper, is more abundant in the upper beds than in the others, and is therefore very common in the Visé Limestone, and in that near Glasgow, as well as in other places in England and Ireland. In Australia, Mr. R. Etheridge cites it from Leig [Lady] Mary Reef, Gympie Gold-field, Queensland; and Mr. W. B. Clarke found it in a greyish limestone between the Page, Hunter, and Rouchel Rivers; at Burragood, on the Paterson; and at Colocolo, New South Wales.

Genus—ORTHOTETES, *Fischer de Waldheim.*

ORTHOTETES CRENISTRIA, *Phillips.*[1]

Pl. X, Fig. 8.

Pecten,	Ure, 1793, Hist. Rutherglen, p. 318, pl. 14, fig. 89.
Orthotetes,	Fischer de Waldheim, 1829, Bull. Soc. Imp. Nat. Moscou, p. 375.
Spirifera crenestria,	J. Phillips, 1836, Geol. Yorkshire, II, p. 216, pl. 9, fig. 6.
„ *senilis,*	*Idem*, 1836, *ibid.*, p. 216, pl. 9, fig. 5.
Orthis spinifera,	McCoy, 1847, Ann. Mag. Nat. Hist., XX, p. 235.
Streptorynchus crenistria,	T. Davidson, 1860, Mon. Carb. Brach. Scotland, p. 32, pl. 1, fig. 16–25.
„ „	*Idem*, 1861, Mon. Brit. Carb. Brach., p. 124, pl. 26, fig. 1, pl. 27, fig. 1–5 and fig. 10?, and pl. 30, fig. 14–16.
Orthis crenistria,	F. Roemer, 1863, Zeits. Deutsch. Geol. Gesell., p. 592, pl. 16, fig. 5.
Streptorynchus crenistria,	T. Davidson, 1866, Quart. Journ. Geol. Soc., XXII, p. 42, pl. 2, fig. 10.
„ „	J. W. Dawson, 1868, Acad. Geol., p. 296, fig. 96.
„ „	F. Roemer, 1870, Geol. von Ober-Schlesien, p. 90, pl. 7, fig. 3, pl. 8, fig. 4.
Orthotetes crenistria,	L. G. de Koninck, 1873, Rech. Anim. Foss., II, p. 44, pl. 2, fig. 4. (For reference to Synonomy).
Streptorynchus crenistria,	F. Toula, 1873, Sitzung. K. Akad. Wissen. Wien, LXVIII, p. 274, pl. 3, fig. 16.

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[1] [*Vide* A. H. Foord, Geol. Mag., 1890, VII (3), p. 154,—W.S.D.]

Streptorynchus Hallianus, O. A. Derby, 1874, Bull. Cornell Univ., I, No. 2, p. 35, pl. 5, fig. 1, 2, 5, 8, 12, 14, 16, 18, and pl. 8, fig. 3.
,, *Tapajotensis, Idem*, 1874, *ibid.*, p. 37, pl. 5, fig. 3, 6, 7, 9, 10, and pl. 8, fig. 9.
,, ,, F. Toula, 1875, Neues Jahrb. für Min., p. 252.
,, ,, var. *macrocardinalis? Idem*, 1875, *ibid.*, p. 253, pl. 8, fig. 5.
Orthis (*Streptorynchus*) *eximiæformis? Idem*, 1875, Sitzung. K. Akad. Wissen. Wien, LXXI, p. 548, pl. 2, fig. 7.

This shell is rather large when normally developed, but is much subject to distortion and irregular development. When its growth has not met with interference it is rather depressed, sub-semicircular, and broader than long. The Australian specimen now under notice answers to this description. The ventral valve, the only one known, is slightly but regularly ventricose, except for a little depression near the ears; its hinge line is a little shorter than the transverse diameter; the whole surface is covered with numerous filiform radiating ribs, the principal ones originating at the beak, and extending from it to the margins, slightly thickening in that direction: between these principal ribs, and at a given distance from the beak, secondary and thinner ribs arise, one or two of which thicken and behave precisely like the principal ribs. All the spaces between these ribs are crossed by concentric lines of growth, often slightly undulating, giving the valve a rugose appearance. This rugosity sometimes extends even to the ribs.

Dimensions.—The specimen I have just described is only twenty-seven millimetres long by thirty-six broad.

Horizon and Localities.—I am uncertain as to whether the Devonian fossils considered by many authors as belonging to this species really do belong to it, because most of the specimens so determined, being badly preserved, might possibly be only *O. umbraculum*, Schlotheim, altered or lacking some characteristics. I have no doubt that *O. spinigera*, McCoy, is merely a variety of *O. crenistria*. *O. crenistria* is rather rare in the Lower Carboniferous beds, but very abundant in the upper beds of the Carboniferous Limestone. The specimens found by Mr. W. B. Clarke come from a brownish limestone veined with green, found between Karua and Dungog. In Brazil it was found in the limestone at Bonjardin and Itaituba. The characteristics of *Streptorynchus Halliana* and *S. tapajotensis* of Mr. Derby seem to me sufficiently like certain European varieties of *O. crenistria* to be considered as belonging to that species.

Genus—ORTHIS, *Dalman.*

ORTHIS RESUPINATA, *Martin.*[1]

Pl. X, Fig. 9.

Anomiæ striatæ,	Ure, 1793, Hist. Rutherglen, p. 314, pl. 14, fig. 13, 14.
Anomites resupinatus,	Martin, 1809, Petrif. Derbiensis, p. 12, pl. 49, fig. 13, 14.
Orthis resupinata,	L. G. de Koninck, 1843, Descr. Anim. Foss. Terr. Carb. Belg., p. 224, pl. 13, fig. 9 et 10.
,, *striatula,*	McCoy, 1847, Ann. Mag. Nat. Hist., XX, p. 234.
,, *australis,*	*Idem*, 1847, *ibid.*, XX, p. 234, pl. 13, fig. 4 and 4*a*.
,, *resupinata,*	T. Davidson, 1861, Mon. Brit. Carb. Brach., p. 130, pl. 29, fig. 1–6, and pl. 30, fig. 1–5.
,, ,,	F. Roemer, 1863, Zeits. Deutsch. Geol. Gesell., p. 591, pl. 16, fig. 4.
,, ,,	L. G. de Koninck, 1872, Rech. Anim. Foss., II, p. 47, pl. 2, fig. 5 (for synonymy; non *idem* Toula, 1875, Neues Jahrb. für Min., p. 187, pl. 7, fig. 9).
,, *resupinoïdes,*	Cox, Pal. Rept. Geol. Rept. Kentucky, III, p. 570, pl. 9, fig. 1.

This species is capable of reaching a great size, and although specimens five or six centimetres long are not uncommon in Europe, yet none of those which I have examined reached that size; the largest does not exceed four centimetres. The shell is usually transverse, oval or elliptical, and its valves are convex. The dorsal valve is sometimes gibbous; its hinge line is short, being only about half the transverse diameter. The ventral valve is usually not so deep as the dorsal valve; its middle part is often depressed towards the front; its beak is small and slightly recurved; its hinge area is triangular and small, and provided with a deltoid fissure, not covered. The dorsal valve, much more convex than the ventral valve, is also more regularly ventricose. The external surface of both valves is ornamented with numerous fine radiating ribs. Some of these originate at the beak, and slightly thicken as they approach the margins, occasionally giving rise to short tubular spines; between these ribs new ones arise by interposition. The test is perforated by innumerable tiny canals, the external orifices of which are perceptible as fine punctures covering the surface. In the interior of the ventral valve are some rather large dental plates, extending nearly parallel for some distance, bordering each side of the muscular impressions, which are separated by a rather thick median septum, thus giving rise to the formation of two elongated depressions, under which are seen traces of muscular impressions composed of several thin, scarcely perceptible, trunks. The dorsal valve possesses a tri-lobed cardinal process, placed between two very oblique well-developed brachial processes, beneath which is a rather broad median protuberance, replacing the median septum, and serving to separate into two the four impressions of the adductor muscles. It is remarkable that among many specimens of this species I have not found a single one belonging to the variety which Professor Phillips named *O. connivens;* they all connect themselves with the typical variety first described by Martin.

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[1] [*Vide* R. Etheridge, Junr., Geol. and Pal. Q'land., 1892, p. 244, t. 11, f. 26, 28. There is no doubt that De Koninck was in error in referring M'Coy's *Orthis australis* to this species. It is a valid species, very characteristic of our Carboniferous Beds, and is of the same type as the European *O. Michelini.*—W.S.D.]

Dimensions.—The largest of the Australian specimens is four centimetres long by five broad.

Relations and Differences.—It would have been unnecessary to insist on the differences between this species and *O. striatula*, Schlotheim, if it had not been confounded with it by McCoy, who has also described and figured a young individual of it under the name *O. australis.* To confirm this statement, it will suffice to compare the figure published by McCoy with those I have given. As to the difference between it and *O. striatula,* it consists not only in the internal structure, but still more in the general form of the two species, and in the nature of the striæ or ribs with which their surface is ornamented.

Horizon and Localities.—This species is very abundant in the various beds of the Carboniferous System, and seems to have existed throughout the whole Carboniferous Period. It is very common in Ireland, Scotland, and England, also at Visé and Tournay. In Australia it was found at Lewin's Brook, Burragood, Colocolo, and Pallal, on the Gwydir.

ORTHIS MICHELINI, *Leveillé*.[1]

Pl. X, Fig. 10.

Anomiæ striatæ,		D. Ure, 1793, Hist. Rutherglen, p. 316, pl. 14, fig. 13, 14.
Terebratula Michelini,		Leveillé, 1835, Mém. Soc. Géol. France, II, p. 39, pl. 2, fig. 14–17.
Spirifera filiaria,		J. Phillips, 1836, Geol. Yorkshire, II, pl. 11, fig. 3.
Orthis Michelini,		L. G. de Koninck, 1843, Descr. Anim. Foss. Terr. Carb. Belg., p. 228, pl. 13, fig. 8, 10*c*, 10*d*.
,,	***filiaria,***	Portlock, 1843, Rept. Geol. Londonderry, p. 458.
,,	***divaricata,***	McCoy, 1844, Synop. Carb. Foss. Ireland, p. 123, pl. 20, fig. 17.
,,	***circularis,***	*Idem*, 1844, *ibid.*, p. 122, pl. 20, fig. 19.
,,	***filiaria,***	*Idem*. 1844, *ibid.*, p. 123.
,,	***Michelini,***	E. de Verneuil, 1845, in Murchison, de Verneuil and de Keyserling, Russia and the Ural Mts., II, p. 185, pl. 12, fig. 7.
,,	,,	P. v. Semenow, 1854, Foss. Brach. Schles. Kohlenkalkes, p. 26, pl. 3, fig. 11 (Zeits. Deutsch. Geol. Gesell., VI, p. 342).
,,	,,	McCoy, 1854, Brit. Pal. Foss., p. 448.
,,	***Michelini,*** var. ***Burlingtonensis,***	J. Hall, 1858, Rept. Geol. Survey Iowa, I, p. 596, pl. 12, fig. 4.
,,	,,	M. v. Grünewaldt, 1860, Mém. Acad. Imp. St. Pétersbourg, II (7), p. 108.
,,	,,	T. Davidson, 1860, Mon. Carb. Brach. Scotland, p. 30, pl. 1, fig. 7–10.
,,	,,	*Idem*, 1861, Mon. Brit. Carb. Brach., p. 133, pl. 30, fig. 6–12.
,,	,,	J. Gray, 1865, Biograph. Notice of D. Ure, p. 51.
,,	***Penniana,***	O. A. Derby, 1874, Bull. Cornell Univ. (Sci.), 1, No. 2, p. 26, pl. 5, fig. 13, 15, 17, 19–22, and pl. 8, fig. 2.

This shell is generally sub-circular, sometimes slightly elongated and sub-triangular; its greatest transverse diameter is found at a short distance from the frontal margin, which a median depression of the valves often renders slightly sinuous. The ventral valve is usually flatter and shallower than the dorsal valve; its beak is small, pointed, slightly recurved, and scarcely projects over that of the opposite valve; its hinge area is small, triangular, and furnished with a deltoidal fissure, which is covered by the cardinal process of the dorsal valve; its length is about one-third that of the transverse diameter. The dorsal valve is a little more convex than the ventral valve, and is often slightly depressed towards the frontal margin. The external surface of both valves is covered with numerous fine radiating ribs, increasing in number by bifurcation or interposition. All these ribs may give rise to innumerable small spines, traces of which are most observable towards the margins of the shell. The internal structure of each valve is remarkable, and can be studied with ease on specimens from certain localities. On the interior of the ventral valve the dental plates extend for some distance, and limit the muscular impressions; on a level with the deltoidal fissure, and between the dental plates, is a transversely striated impression, which has probably served as the attachment for the muscle of the peduncle. Immediately below this is a small median oval impression, on the sides of which are visible very much larger impressions composed of two distinct parts, the anterior of which probably belongs to the cardinal muscle, and the other to the adductor muscle. Some ovarian and vascular impressions are often visible. The cardinal process is situated between two projecting teeth in the interior of the dorsal valve. The cardinal and peduncular impressions, reunited and ramifying, are divided in their median part by a small furrow which served as the attachment for the adductor.

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[1] [It is probable that the fossils referred to this species are *Orthis australis*, McCoy. Compare R. Etheridge, Junr., Geol. and Pal. Q'land., 1892, p. 245, t. 11, f. 27. 29.—W.S.D.]

Dimensions.—The largest Australian specimen sent me is exactly twenty-five millimetres long, and about as broad; its thickness is about six millimetres.

Relations and Differences.—*O. Michelini* resembles *O. resupinata*, Martin, and *O. Keyserlingiana*, de Koninck, in its external ornamentation, but it differs in its internal structure, and by the slight development of its hinge area; it is also less susceptible to variations than *O. resupinata*, and never reaches the huge dimensions sometimes acquired by this last. In spite of all the care I have taken to compare Mr. O. A. Derby's description of *O. Penniana*, and the figures he has drawn of it, with the numerous specimens of *O. Michelini*, Leveillé, at my disposal, taken from the Tournai Limestone, I can perceive no difference sufficient to prove that it is a distinct species. It appears to me to be merely a local variety.

Horizon and Localities.—This species occupies a very widespread horizontal position, and is abundant in some localities. It is more common in the lower than in the upper beds of Carboniferous formations. It is of very frequent occurrence at Tournai, but very rare in the Visé limestone. It is abundant in some shales in Ireland and Scotland. It is also found in the limestone of Settle and Bolland, Yorkshire, and Cosatchi-Datchi, Russia; and, according to Mr. J. Hall, in that of Burlington (Iowa), De Quincy (Illinois), and Hannibal (Missouri), in North America. Mr. O. A. Derby says it is much more abundant than any other species of Brachiopod at Bonjardin and Itaituba, Brazil. In New South Wales it was found in a greyish limestone at Buchan, on the Gloucester River, associated with *Productus semireticulatus*, Martin; also at Burragood and Colocolo, in a greenish-grey, or brownish, argillaceous limestone. In these last-named localities the specimens are nearly all internal casts, easily determined by the impressions on the dorsal valve.

Genus—RHYNCHONELLA, *Fischer de Waldheim.*

RHYNCHONELLA PLEURODON, *J. Phillips.*[1]

Pl. IX, Fig. 4.

Anomiæ striatæ,	D. Ure, 1793, Hist. Rutherglen, p. 313, pl. 14, fig. 6.
Terebratula tritoma,	G. Fischer de Waldheim, 1809, Not. Foss. Gouv. Moscou, p. 34, pl. 2, fig. 7, 8, and 9.
„ *pleurodon,*	J. Phillips, 1836, Geol. Yorkshire, II, p. 326, pl. 12, fig. 25–30 (fig. 16 *exclusâ*).
Rhynchonella pleurodon,	T. Davidson, 1861, Mon. Brit. Carb. Brach., p. 100, pl. 23, fig. 9–15 (fig. 10*a exclusâ*).
„ „	L. G. de Koninck, 1872, Rech. Anim. Foss., II, p. 50 (for synonymy).

This shell is of medium size, usually transversely oval, with more or less gibbous valves, furnished with a variable number of sharp radiating plicaplications, originating at the beaks. These plications are separated from each other by furrows that are deep and angular for the greater part of their length. The mesial plications are nearly straight, but the lateral plications are more or less curved, according to their position. The beak of the ventral valve is small, very slightly incurved, and not prominent; immediately below its pointed extremity is the deltidium, pierced by a small circular foramen. The ventral furrow is generally rather broad, and composed of four mesial plications, separated from the lateral plications by a more strongly developed plication.

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[1] [*Vide* R. Etheridge, Junr., Geol. and Pal. Q'land., 1892, p. 244. t. 11, f. 23.—W.S.D.]

In adult specimens the ventral furrow, midway in its course, rises abruptly towards the front. The dorsal valve is rather regularly ventricose, and its dorsal ridge not often strongly developed; there is always one more plication in the dorsal ridge than there is in the ventral furrow.

Dimensions.—The largest of the Australian specimens was eighteen millimetres broad by twelve long, and its thickness seven millimetres.

Relations and Differences.—This species is easily distinguished from its Carboniferous allies by its general shape, and by the form of its plications. I have before stated that the *Rhynchonella* figured by me under the name *R. Davreuxiana* does not form a variety of this species, as Mr. Davidson supposed, but is a perfectly distinct species.

Horizon and Localities.—This species seems to have existed throughout the Carboniferous Period properly so called, beginning in the Tournai beds, where it is found abundantly. It is even more abundant in the upper strata of Anseremme and Visé. It is equally abundant about Glasgow; is found in the Valley of Sichon, France, and at Bleiberg, in Carinthia; it is not uncommon in England and Ireland, and it has been found in Russia and Thibet. In New South Wales it was discovered at Coyeo, on the Page River, between the Karua River and Dungog, and at Burragood in a yellowish sandstone, and in a brownish argillaceous limestone.

RHYNCHONELLA INVERSA, *L. G. de Koninck.*[1]

Pl. XI, Fig. 11.

This shell is one-third longer than broad, subpentagonal, and having its greatest transverse diameter in about the middle of its length. The ventral valve is regularly curved, and is furnished with a mesial fold extending from the beak to the base, becoming thicker in its course; two other folds, thicker and oblique, are placed on each side of the mesial fold. The furrows separating these folds are rounded at the bottom. The beak is rather thick, only slightly incurved, obliquely truncated, with an oval, relatively large, foramen. The dorsal valve is nearly as deep as the ventral valve, and has a rather deep, but not very broad, mesial furrow, limited on each side by a fold, the side of which furthest from the furrow is strongly developed, and reaches the bottom of a second lateral fold a little recurved, and much less angular than the first lateral fold. The beak is much more acute than that of the ventral valve, beneath which it articulates; the lateral parts of the beak are depressed. The external surface of the shell is provided with a number of nearly equidistant concentric lines of growth.

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[1] [This has been shown by Mr. R. Etheridge, Junr., to be a species of *Dielasma*. Records Geol. Survey N. S. Wales, 1898, V, Pt. 4, p. 175, t. 19, f. 1-13.—W.S.D.]

Dimensions.—The length is thirty, the breadth twenty, and the thickness fourteen millimetres.

Relations and Differences.—This species strongly resembles the variety *R. angulata*, Linné, which Mr. Davidson represented in Pl. 19, Fig. 13 of his Monograph of the Carboniferous Brachiopods of the British Islands. The mesial fold, instead of being on the dorsal valve, as in most *Rhynchonellæ*, is on the ventral valve, occupying its whole length, and being replaced on the dorsal valve by a corresponding furrow. But it is possible to distinguish between the two, because in *R. inversa* the ribs and the front are sharply cut, while they are obtuse in every variety of *R. angulata*, as Mr. Davidson's numerous figures of it prove. Again, I have examined many specimens of *R. angulata*, and have never noticed any lines of growth on its surface like those of *R. inversa*. Besides, the beak of *R. inversa* is much thicker, and its foramen much larger and more oblique.

Horizon and Localities.—A single specimen of this beautiful species was found by the Rev. W. B. Clarke in the Muree Quarry, Raymond Terrace, near the junction of the Williams and Hunter Rivers.

Genus—ATHYRIS, *McCoy.*

ATHYRIS PLANOSULCATA, *J. Phillips.*[1]

Pl. XI, Fig. 6.[2]

Spirifera planosulcata,	J. Phillips, 1836, Geol. Yorkshire, II, p. 220, pl. 10, fig. 15.
Terebratula de Royssii,	E. de Verneuil, 1840, Bull. Soc. Géol. France, XI, p. 259, pl. 3, fig. 1*a* and 1*c* (fig. 1*b*, 1*d*, 1*e* exclusis, non Leveillé).
Atrypa planosulcata,	J. de C. Sowerby, 1840, Min. Conch., VII, p. 15, pl. 617, fig. 3.
,, *oblonga,*	*Idem*, 1840, *ibid.*, p. 16, pl. 617, fig. 3.

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[1] [*Actinoconchus planosulcatus.*—R. Etheridge, Junr., Records Geol. Survey N. S. Wales, 1898, v, Pt. 4, p. 177, t. 19, f. 18. *Athyris Roysii*, R. Etheridge, Junr., Procs. Linn. Soc. N. S. Wales, 1895, IX, Pt. 3, p. 529, t. 39, f. 4.—W.S.D.]

[2] [Pl. IX, fig. 6.—W.S.D.]

Terebratula planosulcata,	L. G. de Koninck, 1843, Descr. Anim. Foss. Terr. Carb. Belg., p. 301, pl. 21, fig. 2.
Actinoconchus paradoxus,	McCoy, 1844, Synop. Foss. Ireland, p. 156, pl. 21, fig. 6.
Athyris planosulcata,	*Idem*, 1844, *ibid.*, p. 148.
Atrypa? obtusa,	*Idem*, 1844, *ibid.*, p. 155, pl. 22, fig. 20.
Spirigera planosulcata,	A. d'Orbigny, 1850, Prod. Pal., I, p. 150.
Athyris ,,	J. Morris, 1854, Cat. Brit. Foss., p. 131.
Spirigera ,,	v. Semenow, 1854, Ueber Foss. schles. Kohlenkalkes, p. 21.
Terebratula ,,	De Keyserling, 1854, in Schrenk's Reise Nordosten Europ. Russlands, I, p. 91.
Athyris paradoxa,	McCoy, 1855, Brit. Pal. Foss., p. 436.
,, ,,	M. v. Grünewaldt, 1860, Mém. Acad. Imp. Sci. St. Pétersbourg, II (7), p. 105.
,, *planosulcata,*	T. Davidson, 1859, Mon. Brit. Carb. Brach., p. 80, pl. 16, fig. 2–13, 15.
,, ,,	*Idem*, 1860, Mon. Carb. Brach. Scotland, p. 16, pl. 1, fig. 10, 11.
,, *parvirostris,*	Meek and Worthen, 1860, Procs. Acad. Nat. Sci. Philadelphia, p. 451.
,, *planosulcata,*	L. G. de Koninck, 1872, Rech. Anim. Foss., II, p. 54.

This is a sublenticular shell, with slightly convex valves of nearly equal depth, sometimes slightly inflected or depressed at the base. The beak of the ventral valve is small, rather pointed, incurved, and pierced by a small foramen, not always very distinct, and placed at the edge of the opposite valve. The surface of both valves is ornamented with numerous parallel concentric lamelliform expansions, each of which is flat and longitudinally striated. The spiral supports, consisting of twelve or fifteen spiral turns, fill the greater part of the interior of the shell. The muscular impressions are very small, and faintly marked.

Dimensions.—The best preserved specimen sent me is only eleven millimetres long and ten broad, with a thickness of about four millimetres.

Relations and Differences.—In explanation of the list of synonyms given above, I must state that Mr. McCoy has not only described this species under three different names, but has placed it in three distinct genera, according as his specimens exhibited more or less well-preserved traces of the lamelliform expansions which characterise the shells. Mr. McCoy holds that his *A. paradoxa* is not identical with *A. planosulcata*, J. Phillips; but Mr. T. Davidson, who has compared the original specimens, says that it is, and I agree with him entirely.

Horizon and Localities.—*A. planosulcata* is chiefly developed in the upper strata of the Carboniferous System. It is very abundant at Blacklion, Millecent &c., Ireland; at Lowick, Longnor, Settle, and Bolland, England; at Hawsdorf, Silesia; and at Visé, Belgium. Messrs. De Keyserling and von Grünwaldt found it in Russia. Mr. W. B. Clarke found several specimens of it, nearly all internal casts, and all deprived of their lamelliform expansions, a circumstance which renders the determination of some of them doubtful. These specimens all come from Burragood, where they are found in a brownish limestone, except one which was found in a white limestone. A single specimen, with the test well preserved, was found in an oolitic limestone near Dungog, on the Williams River.

Genus—SPIRIFER, *Sowerby.*

SPIRIFER LINEATUS, *W. Martin.*[1]

Pl. XI, Fig. 9.

Conchyliolithus anomites lineatus,	W. Martin, 1809, Petrif. Derbiensis, p. 12, pl. 36, fig. 3.
Terebratula? lineata,	Sowerby, 1822, Min. Conch. IV, p. 39, pl. 334, fig. 1 (non *Sp. lineatus,* V, pl. 493, fig. 1).
Spirifera „	J. Phillips, 1836, Geol. Yorkshire, II, p. 219, pl. 10, fig. 17.
Spirifer lineatus,	L. G. de Koninck, 1842, Descr. Anim. Foss. Terr. Carb. Belg., p. 270, pl. 6, fig. 5, and pl. 17, fig. 8.
„ „	Shumard, 1855, Geol. Survey Missouri, p. 216.
„ „	J. Hall, 1856, Rept. Pacific Railroad, III, p. 101, pl. 2, fig. 6–8.
Spirifera lineata,	T. Davidson, 1859, Mon. Brit. Carb. Brach., p. 62, pl. 13, fig. 1–13.
Spirifer lineatus,	Newberry, 1861, in Ives's Rept. Colorado River, p. 127.
„ *lineatus?*	F. B. Meek, 1872, Final Rept. Geol. Survey Nebraska, pl. 2, fig. 3.
„ „	*Idem*, 1872, Rept. Pal. E. Nebraska, pl. 2, fig. 3.
„ „	L. G. de Koninck, 1873, Rech. Anim. Foss., II, p. 56, pl. 2, fig. 11 (for synonymy).

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[1] [*Reticularia lineata.*—A. H. Foord, Geol. Mag., 1890, VII (3), p. 153.—W.S.D.]

Spirifera (*Martinia*) *perplexa*, O. A. Derby, 1874, Bull. Cornell Univ. (Sci.), I, No. 2, p. 16, pl. 3, fig. 27, 39, 40, 45, 50, and pl. 8, fig. 13.

Spirifer lineatus, F. Toula, 1874, Sitz. K. Akad. Wissen., LXX, p. 5, pl. 1, fig. 2.

„ „ *Idem*, 1875, *ibid.*, LXXI, p. 545, pl. 2, fig. 3.

This shell is oval in contour, usually transverse, but rarely longer than broad. The hinge area is not well developed, and not easily seen on account of the strong curve of the beaks, which overhang it and approach each other closely at their extremities; the deltoidal fissure is partly covered by a pseudo-deltidium. Among normally developed individuals the two valves are of nearly equal depth, and regularly curved; when the ventral valve is sinuous, which is not often, the ventral furrow is broad and not well marked, and is apparent only by the sinuosity of the base. When the dorsal valve has a dorsal ridge this is also obscure, and never projects beyond the base. The external surface of both valves is ornamented with concentric lines of growth produced by thin imbricated lamellæ, the development of which seems to be interrupted at rather short but regular distances, in order to give rise to some small spiniform expansions. It is not often that these expansions are preserved, although to them we must attribute the concentric rows of pits and longitudinal striæ which have caused some varieties to be considered distinct species. Although the shells of this species have seldom preserved their spiral supports, they present no well-marked structural characteristic to distinguish them from other *Spiriferæ*, or to maintain them in the genus *Martinia*, which McCoy created for them.

Dimensions.—The largest Australian specimen sent me is thirty-six millimetres long and forty-three millimetres broad.

Horizon and Localities.—This species is very widespread in the Carboniferous System, but is more abundant in the upper than in the lower beds. It is very common at Visé and in many localities in Yorkshire and Ireland. In New South Wales it was found in a greyish limestone at Buchan, and between the Karua River and Dungog; also in a brownish sandstone in the Muree Quarry, Raymond Terrace.

SPIRIFER CREBRISTRIA, *J. Morris.*[1]

(Or *Spirifer lineatus*, W. Martin, *varietas?*)

Pl. IX, Fig. 5.

Spirifer (*Terebratula?*) *crebristria*, J. Morris, 1845, in Strzelecki's Phys. Descr. N. S. Wales and V. D. Land, p. 279, pl. 15, fig. 2.

Spirifera (*Reticularia*) *crebristria*, F. McCoy, 1847, Ann. Mag. Nat. Hist., XX, p. 232.

This shell is transverse, elliptical, and slightly ventricose. The ventral valve has a broad, shallow, ventral furrow, to which on the dorsal valve corresponds an imperfectly developed dorsal ridge, becoming apparent only by the sinuosity of the base. The whole surface of the internal cast is ornamented by numerous fine, radiating, rather deep striæ, bifurcating at intervals, and keeping the same diameter throughout their length. These striæ are crossed by numerous concentric undulations of growth, producing a reticulated design.

Dimensions.—The length is thirty and the breadth thirty-eight millimetres.

Relations and Differences.—This *Spirifer* is extremely like *S. ellipticus*, J. Phillips, which is only a variety of *S. lineatus*, Martin, the radiating striæ of which become apparent when the test is partly removed. Again, as all the specimens sent me are internal casts, the muscular impressions of which are only partly visible, I am very much inclined to think that *S. crebistria*, Morris, is also only a variety of *S. lineatus*, Martin, in which, owing to special circumstances, the longitudinal striæ are better and more regularly developed. I am the more encouraged to hazard this opinion by the fact that one of the specimens of *S. lineatus* just described by me shows, on a small part of its surface, where the shell is removed, the radiating longitudinal striæ which form the chief characteristic of *S. crebristria*, J. Morris. Nevertheless, as I have seen on no European specimen the characteristic I have just described as on the Australian specimen, I have retained to the variety described by Mr. J. Morris the name under which the learned Palæontologist has figured it.

Horizon and Localities.—The specimen described by Mr. Morris was found at Booral. Mr. McCoy says the species is rather rare in the shales of Dunvegan, and in the sandstone forming the summit of a hill one mile south of Trevallyan. All the specimens sent by Mr. W. B. Clarke come from Burragood, on the Paterson.

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[1] [*Reticularia crebristria.*—A. H. Foord, Geol. Mag., 1890, VII (3), p. 153.—W.S.D.]

SPIRIFER GLABER, *W. Martin.*

Pl. XI, Fig. 8, and Pl. XII, Fig. 1.[1]

Conchyliolithus anomites glaber,	W. Martin, 1809, Petrif. Derbiensis, p. 11, pl. 48, fig. 9, 10.
Spirifer glaber,	J. Sowerby, 1821, Min. Conch., III, p. 123, pl. 269, fig. 1, 2.
„ „	L. G. de Koninck, 1843, Descr. Anim. Foss. Terr. Carb. Belg., p. 267. pl. 18, fig. 1.
Spirifera subradiata,	G. Sowerby, 1844, in Darwin's Geol. Obs. Volc. Islands, p. 158.
Spirifer subradiatus,	J. Morris, 1845, in Strzelecki's Phys. Descr. N. S. Wales and V. D. Land, p. 281, pl. 16, fig. 1–4 (pl. 15, fig. 5 exclusâ).
Spirifera subradiata,	(? var. resembling *Spirifera glabra*), F. McCoy, 1847, Ann. Mag. Nat. Hist., XX, p. 233.
Spirifer glaber,	J. D. Dana, 1849, Geol. Wilkes' U. S. Explor. Exped., p. 683, pl. 1, fig. 6.
Spirifera glabra,	T. Davidson, 1859, Mon. Brit. Carb. Brach., p. 59, pl. 11, fig. 1–9, and pl. 12, fig. 1–5, 11 and 12.
„ „	J. W. Dawson, 1868, Acad. Geol., p. 211, fig. 89.
Spirifer glaber,	L. G. de Koninck, 1872, Rech. Anim. Foss., II, p. 57, pl. 2, fig. 12 (for synonymy).

This shell is very variable in shape and proportions, and can acquire very large dimensions. It is usually transversely oval, rather thick, rarely longer than broad. Its valves are regularly ventricose, and of nearly equal depth. The beak of the ventral valve is thick, and strongly incurved upon itself, but scarcely projects beyond the plane of the hinge area. The hinge area is small, triangular, and nearly flat, provided with a triangular deltoid fissure, partly covered by a pseudo-deltidium. The ventral furrow is more or less well marked, the depth varying with the age and dimensions of the individuals, occasionally showing a faint longitudinal furrow at the bottom. The dorsal ridge of the dorsal valve, though generally regularly curved, is sometimes divided by a mesial furrow corresponding to that of the ventral furrow. The sides or the dorsal ridge are not always well marked, but frequently merge insensibly into the adjacent parts of the valve. The base is always very sinuous in adults, even when they are only of moderate size. The surface of both valves is generally smooth, or merely furnished with fine concentric lines of growth; and some specimens, on their lateral regions, show traces of radiating ribs. The test is rather thin and perforated, as is easily seen on examining some of the specimens from Australia and Belgium. In this case the whole surface is covered with well-marked punctures arranged quincunxially. Although *S. glaber* is one of the commonest species of our upper Carboniferous Limestone, I have never yet been able to procure in Belgium an internal cast, or isolated valves of it, which would enable me to study the internal structure or framework. But these are very plentiful among the Australian specimens, and so I have satisfied myself that the cardinal process is extremely well developed, and very solid. It is supported in the ventral valve by two strong diverging dental plates, placed on each side of the deltoidal fissure, and prolonging themselves like ridges, not well-marked, on each side of the muscular impressions, and coming together again in a sharp point near the middle of the length of the valve, or a little below it. The impressions of the cardinal muscles form a very elongated oval, longitudinally striated, and parted in the middle by a faintly marked double septum, limiting the very narrow impression of the cardinal (?) muscle. On the sides are found well-developed ovarian spaces (Pl. 12, Fig. 1*b*). The muscular impressions of the dorsal valve are more or less long, according to the specimen, and consist of two impressions of the adductor muscles, producing by their union an elongated oval, divided lengthways by a small median septum, at the upper extremity of which is a small triangular impression striated lengthways, which has probably served as the attachment of the peduncle (Pl. 12, Fig. 1*c*). The spiral supports are well developed, and fill the greater part of the interior of the shell.

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[1] [The form figured here is now referred to Waagen's genus or subgenus *Martiniopsis*, and is known as *Martiniopsis subradiata*, G. Sby. *Vide* R. Etheridge, Junr., Geol. and Pal. Q'land, 1892, pp. 236–239, t. 11, f. 14.—W.S.D.]

Dimensions.—These are very variable. The following measurements are taken from three rather large specimens:—

Length.		Breadth.		Thickness.	
70	......	76	......	40	millimetres.
55	......	95	......	36	,,
67	......	80	......	57	,,

I agree with Mr. Dana in considering the specimens described and figured (Pl. 16 in Strzelecki's work) by Mr. Morris under the name *S. subradiatus* identical with *S. glaber*, W. Martin. They are exactly like those now under my notice, and those figured in my atlas, and differ in no way from the English and Belgian specimens figured by myself and my learned friend Mr. T. Davidson. I do not think, however, that the specimen figured by Mr. J. Morris (Pl. 15, Fig. *5a* of the same work) under the same name is a *S. glaber;* I think it is a young individual of the remarkable species which I have described further on, and named after Mr. Darwin.

Horizon and Localities.—This *Spirifer* is very abundant in the upper strata of the Carboniferous Limestone, and is much less frequent in the middle and lower strata. Possibly the species called *glaber*, found in these last-named beds, is not *glaber* at all. This is still an open question, but on that account I call attention to the fact that *S. glaber* is found much more frequently at Settle and Bolland, in Yorkshire, near Glasgow, Scotland, and at Cork and Little Island, Ireland, than in other parts of the British Isles where the upper beds are not so well represented. Some magnificent specimens have been sent me by Mr. W. B. Clarke from Ællalong, from a railway cutting between Maitland and Stony Creek; from Branxton, Muree Quarry, Mount Wingen, and Morpeth. Mr. Dana found it at Black Head, Illawarra, and Harper's Hill. Mr. McCoy found it at Darlington, and Mr. J. Morris says it is very abundant at Mount Wellington, Tasmania.

SPIRIFER DARWINII, *J. Morris.*[1]

Pl. X, Fig. 11, Pl. XI, Fig. 10, and Pl. XVI, Fig. 1.

Spirifer Darwinii,	J. Morris, 1845, in Strzelecki's Phys. Descr. N. S. Wales and V. D. Land, p. 279.
„ *subradiatus,*	*Idem,* 1845, *ibid,* p. 281, pl. 15, fig. *5a* (*fig. cæteris exclusis*) (non Sowerby).
„ *Darwinii,*	F. McCoy, 1847, Ann. Mag. Nat. Hist., XX, p. 233.
„ *Darwinii?*	J. D. Dana, 1849, Geol. Wilkes' U. S. Explor. Exped., p. 684, pl. 1, fig. 7.

This is a transversely oval shell, with moderately deep valves. The ventral valve is regularly curved, and has a rather broad shallow furrow, divided centrally by a faint longitudinal furrow; on each side of the ventral furrow are three or four broad radiating lateral folds, of which the last are faintly marked, and disappear almost completely towards the beak. The beak is small, slightly recurved, and not prominent. The hinge area is very small, and decidedly elliptical, not half as long as the transverse diameter of the valve. The ears are rounded. The dorsal valve, not quite so deep as the ventral valve, has a small well-defined ridge, slightly depressed in the middle. The lateral folds, three or four on each side, are usually more pronounced than in the ventral valve. The test is very thin. The external surface is ornamented by innumerable small granulations, rather regularly arranged quincunxially, and easily visible to the naked eye; they are rounded near the beak, but slightly elongated elsewhere. Some concentric lines of growth are seen rather more numerous near the margin than on the rest of the shell. The internal structure is perfectly known, thanks to the many internal casts sent me by Mr. W. B. Clarke. The most perfect mould (Pl. XI, Fig. 10) shows that the cardinal process is very large, that the muscular impressions are strongly marked, and as deeply hollowed in the shell as those of the preceding species. One specimen has preserved a part of its spiral supports, and shows that the lamellæ were strong and hollow.

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[1] [*Martiniopsis Darwini.*—Waagen, Pal. Indica, Salt Range Fossils, I, 1883, p. 525; IV, Pt. 2, 1891, p. 131, t. 5, f. 9*a*, *b*, *c*. Mr. R. Etheridge, Junr., is of opinion that De Koninck was in error in referring the forms he figures to *Spirifera-Martiniopsis Darwinii*, Morris, and that his specimens are all individuals of *Martiniopsis subradiata*—that is, the same as his *Spirifer glaber*. Geol. and Pal. Queensland, 1892, pp. 238, 240. *See* also Procs. R. Phys. Soc. Edinb., 1880, V, p. 281, t. 7, f. 1-10, t. 8, f. 11.—W.S.D.]

Dimensions.—The well-preserved specimens are mostly small. One of them measures twenty-eight millimetres long, forty-four broad, and eighteen thick. The cast which I have figured as belonging to this species is ninety-three millimetres long, one hundred and eight broad, and forty-five thick. The muscular impression of the ventral valve is forty-six millimetres long, that of the opposite valve being rather shorter and indistinct.

Relations and Differences.—I think that Mr. J. Morris has described and figured, under the name *S. subradiatus*, two perfectly distinct species; one of these, of which he has given several figures on Pl. 16 of Strzelecki's work, seems to me identical with that described by W. Martin as *S. glaber*, having no striking characteristic to distinguish it. Mr. Dana thinks this is the case with all the specimens figured by Mr. J. Morris, but on this point I do not agree with the learned American Naturalist. I think, on the contrary, that Pl. 15, Fig. 5*a* of Strzelecki's work, represents a very different species from the first; as I have before stated, (1) it is the only one that I consider is a young individual of *S. Darwinii*, J. Morris. It differs from *S. glaber* by its shallower valves, its much sharper margin, by the slighter curvature of its beak, and, above all, by its large lateral folds. I do not deny that some specimens of *S. glaber* have also lateral folds, but when these exist they are always very superficial, thinner and much more numerous than in *S. Darwinii.* Mr. Dana has confounded this species with the *S. Hawkinsii,* J. Morris and D. Sharpe, which latter is Devonian, and which also is easily distinguished by the length of its area, which occupies the greatest diameter of its shell, and by its angular ears.

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(1) Mr. Morris agrees that this specimen has greater affinities with *S. Darwinii.*

Horizon and Localities.—This species appears common in New South Wales. Mr. J. Morris says there are large casts of it found in a Carboniferous sandstone at Glendon. Mr. McCoy says it is common in the arenaceous shales of Loder's Creek and Barraba, but rather rare in the arenaceous limestones of Black Head. The Rev. W. B. Clarke collected a large number of casts in Muree Quarry, in different railway cuttings between Maitland and Stony Creek, at Mount Wingen, and Harper's Hill. The small specimen, like that which has been figured by Mr. J. Morris, and which I have represented in Pl. X, Fig. 11, comes from Harper's Hill. Only one specimen has preserved a large piece of its shell. This shell is very fibrous in great part of its length, but shows in places the remains of granulations which ornament the surface of young individuals, and so leaves no doubt as to the determination of the species. (Pl. X, Fig. 11.)

SPIRIFER OVIFORMIS, *F. McCoy.*[1]

Pl. XII, Fig. 3.

Spirifer oviformis, McCoy, 1847, Ann. Mag. Nat. Hist., XX, p. 234, pl. 48, fig. 5, 6.

This shell is nearly as long as broad, subtrigonal when well preserved, with valves of equal depth, having their greatest diameter towards the lower third of their length. The ventral valve has a broad deep furrow, on each side of which are two or three radiating lateral folds, rounded, and separated from each other by furrows of the same breadth. The hinge area should be narrow and occupy only about one-third of the breadth of the shell. The dorsal ridge is very large, and has a longitudinal furrow down its centre, beginning at the beak and extending evenly to the base. The numerous internal casts I have examined show that the muscular impressions of the ventral valve were rather strong and deeply excavated in the test (Pl. XI, Fig. 10), while those of the dorsal valve were very superficial (Pl. XI, Fig. 10*a*). The external surface of both valves must have been ornamented with numerous rather strong, concentric lines of growth, as the internal casts have preserved traces of them.

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[1] [*Martiniopsis oviformis,* McCoy.—W.S.D.]

Dimensions.—The only perfect specimen sent me is thirty-four millimetres long, thirty-six broad, and twenty-six thick. These dimensions do not agree with the distorted specimen described and figured by McCoy, that appears longer than broad because it has sustained lateral pressure during fossilization.

Relations and Differences—This species is easily distinguished from all its congeners by its subtrigonal form. Mr. McCoy relying on the defective shape of his specimen believes it to be longer than broad, and uses this as a characteristic to distinguish it from *S. Darwinii* and *subradiatus*, which it resembles by the lateral folds ornamenting it. I have already remarked that this opinion is wrong, and that far from being longer than broad this species is on the contrary two millimetres broader than long, in well preserved specimens.

Horizon and Localities.—Mr. McCoy says that this species is not uncommon in the sandstone of Barraba. Mr. W. B. Clarke found it at Ællalong, and in a greyish sandstone about 34 miles from Newcastle, and at Wollongong, New South Wales.

SPIRIFER DUODECIMCOSTATUS, *McCoy.*[1]

Pl. X, Fig. 12,[2] and Pl. XII, Fig. 4.

Spirifera duodecimcostata,	F. McCoy, 1847, Ann. Mag. Nat. Hist., XX, p. 234, pl. 47, fig. 2, 3.
Spirifer duodecicostatus,	J. D. Dana, 1849, Geol. Wilkes' U. S. Explor. Exped., p. 684, pl. 2, fig. 1.
„ *Darwinii,*	*Idem,* 1849, *ibid.*, pl. 1, fig. 7, 8 (fig. 7a exclusâ).

This shell is slightly transverse, oval or subrhomboidal, gibbous, broader towards the middle of its length than near the hinge line. The ventral valve is rather regularly curved; its beak is thick but not very prominent; its ears rounded; its hinge area triangular, rather raised, and curved; and its deltoid fissure triangular, and broad at the base. The rather deep ventral furrow is divided in the middle by a well-marked fold, though usually less well-marked than the five or six lateral folds. The dorsal valve is rather more ventricose than the ventral valve; its dorsal ridge is divided centrally by a furrow corresponding to the fold of the ventral furrow. The lateral folds number five or six, are slightly curved, and diminish in thickness as they recede from the centre of the valve. The cardinal process is like that of most Spirifers, but the muscular impressions are small, faint, and superficial.

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[1] [*Spiriferina duodecimcostata*, R. Etheridge, Junr., Geol. Pal. Q'land, 1892, p. 234, t. 44, f. 12; *Spirifera duodecimcostata*, Records Geol. Survey N. S. Wales, 1894, IV, Pt. 1, p. 34, t. 7, f. 4–8.—W.S.D.]

[2] [There is no Fig. 12 on Pl. X of the original work—Fig. 11*b* must be meant to represent *S. duodecimcostata*. In our opinion the form figured is the ventral valve of a ribbed variety of *Martiniopsis subradiata*, G. Sby.—W.S.D.]

Dimensions.—One of the Australian specimens is about four centimetres long and five centimetres broad.

Relations and Differences.—This species differs from *S. oviformis* and *S. Darwinii* by the mesial fold dividing the ventral furrow, no trace of such fold being visible in either of the species just mentioned.

Horizon and Localities.—Mr. McCoy says that this *Spirifer* is not uncommon in the limestone of Wollongong, and the sandstone of Muree Quarry. Mr. J. D. Dana found it in the Illawarra District; and Mr. W. B. Clarke at Wollongong, Bombaderra Creek, at Stroud, and at Ællalong.

SPIRIFER STRZELECKII, *L. G. de Koninck.*[1]

Pl. XIII, Fig. 1 and Pl. XIV, Fig. 1.

Spirifera undifera, var. *undulata*, R. Etheridge, Senior, 1872, Quart. Journ. Geol. Soc., XXVIII, p. 330, pl. 16, fig. 3–5 (non F. Roemer).

This is a transverse, subrhomboidal shell, with valves of nearly equal depth, having its greatest transverse diameter towards the middle of its length. The ventral valve is regularly curved, and has a broad deep furrow rounded at the bottom. By the sides of the ventral furrow are four rather thick folds,—this number includes the folds bounding the ventral furrow. These folds are rounded and divided from each other by furrows of the same breadth as the folds. The beak is thick but not prominent; the hinge area is very much elevated, and is nearly as long as the shell is broad, it is very slightly recurved on itself; the deltoid fissure is large; and the extremities of the ears are rounded. The dorsal ridge is broad and prominent, and is divided centrally by a longitudinal, shallow, but distinct furrow, the existence of which has no influence on the regular form of the ventral furrow. On each side of the dorsal ridge are four folds corresponding with, and analogous to, those of the ventral valve. The surface is ornamented by a number of irregular concentric rings of growth, most apparent near the margins of the shell. The internal casts prove that the shell was very thick near the cardinal process, as will be seen from Pl. XIII, Figs. 1 and 1a. Their structure is like that of the other Spirifers belonging to the same section.

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[1] [*Vide* R. Etheridge, Junr., Geol. and Pal. Q'land, 1892, p. 234, t. 10, f. 5–7.—W.S.D.]

Dimensions.—One very nearly perfect specimen measures fifty-five millimetres long, seventy-four broad, and thirty-two thick.

Relations and Differences.—This *Spirifer* is easily distinguished from the preceding species by the absence of the mesial fold in the ventral furrow. Its much more transverse form, added to the size and greater depth of *S. Darwinii*, prevent confusion with this last. *S. neglectus*, J. Hall,[1] is decidedly the species to which it bears the greatest resemblance; but the different proportions, the absence of the mesial fold in the ventral furrow of *S. neglectus*, and the much greater number of its lateral folds, suffice to distinguish it. Mr. R. Etheridge seems to have confounded this species with *S. undiferus*, F. Rœmer, to which it, nevertheless, bears only a remote resemblance.

Horizon and Localities.—Two specimens with their shells preserved were found, one in the railway-cutting between Maitland and Stony Creek, and the other about thirty-four miles from Newcastle. Many casts have come from Muree Quarry, Raymond Terrace, and from the aforementioned localities. Mr. R. Etheridge found this species at Gympie, Queensland, and he is of opinion that it is Devonian, which seems to me highly problematical.

SPIRIFER CLARKEI, *L. G. de Koninck*.[2]

Pl. XIII, Fig. 2.

This is a transverse, subelliptical shell, having its greatest diameter at the hinge-line. The ventral valve has a broad, shallow furrow, at the bottom of which are sometimes visible two or three rudimentary folds; on each side of the ventral furrow there are thirteen or fourteen radiating, simple, rounded folds, separated by narrow, indistinct furrows. The beak is relatively small and strongly recurved, leaving only a short distance between it and the beak of the dorsal valve. The hinge area occupies the whole breadth of the shell, but is not much elevated. The dorsal valve is a little deeper than the ventral valve, and is slightly depressed near the ears, the lateral margins of which form a right angle with the hinge-line. Its dorsal ridge is broad, prominent, and simple, and has no traces of rudimentary folds. The lateral folds are like those of the ventral valve, to which they correspond. The surface is crossed by undulating concentric rings of growth.

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[1] Rept. Geol. Survey Iowa, I, Pt. 2, p. 643, Pl. 20, Fig. 5.

[2] [Compare R. Etheridge, Junr., Geol. and Pal. Q'land, 1892, p. 229, t. 10, f. 16.—W.S.D.]

Dimensions.—The length is thirty-five millimetres, the breadth sixty, and the thickness twenty-five.

Relations and Differences.—By its external ornamentation this *Spirifer* strongly resembles *S. plenus*, J. Hall, (1) but it cannot be confounded with that, because *S. plenus* is nearly as long as broad, proportionately much thicker, and so much more convex as to be gibbous.

Horizon and Localities.—This lovely species, which I have great pleasure in naming after the indefatigable pioneer of New South Wales, was found by him in a greyish sandstone at Wollongong, and in a black limestone at Jervis Bay, where it seems rare, as he found only one specimen of it at each of these places.

SPIRIFER PINGUIS, *J. Sowerby.*[2]

Pl. XIV, Fig. 2.

Spirifer pinguis,	J. Sowerby, 1820, Min. Conch., III, p. 125, pl. 271.
Spirifera rotundata,	J. de Carle Sowerby, 1824, Min. Conch., V, p. 89, pl. 461, fig. 1 (non W. Martin).
Spirifer rotundatus,	Defrance, 1827, Dict. Sci. Nat., L, p. 295.
,, ,,	Davreux, 1831, Const. Geogr. Province de Liége, p. 272, pl. 7, fig. 8.
Spirifera rotundata,	J. Phillips, 1836, Geol. Yorkshire, II, p. 218, pl. 9, fig. 17.
,, *pinguis*,	*Idem*, 1836, *ibid.*, p. 218, pl. 9, fig. 18, 19.
Terebratula pinguis,	Deshayes, 1836, In Lamarck, Anim. sans Vert., VII, p. 374.

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(1) Rept. Geol. Survey Iowa, p. 603, Pl. 13. fig. 4.

[2] [*Spirifera pinguis*, R. Etheridge, Junr., Geol. and Pal. Q'land, 1892, p. 233.—W.S.D.]

Spirifer pinguis,	L. v. Buch, 1837, Ueber Delthyris, p. 38.
,, ,,	*Idem*, 1840, Mém. Soc. Géol. France, IV, p. 184, pl. 8, fig. 7.
,, *rotundatus,*	L.-G. de Koninck, 1843, Descr. Anim. Foss. Terr. Carb. Belg., p. 263, pl. 14, fig. 2 and pl. 17, fig. 4.
,, *pinguis,*	*Idem*, 1851, *ibid.* (suppl.), p. 661, pl. 56, fig. 5.
Spirifera rotundata,	Portlock, 1843, Rept. Geol. Londonderry, p. 459.
Spirifer pinguis,	A. d'Orbigny, 1850, Prod. Pal., I, p. 148.
,, *rotundatus,*	*Idem*, 1850, *ibid.*, I, p. 148.
,, *pinguis,*	J. Morris, 1854, Cat. Brit. Foss., p. 153.
,, *rotundatus,*	P. v. Semenow, 1854, Foss. schles. Kohlenkalkes, p. 18 (syn. exclusâ).
Spirifera rotundata,	F. M'Coy, 1855, Brit. Pal. Foss., p. 420.
,, *subrotundata,*	*Idem*, 1855, *ibid.*, p. 423.
,, *pinguis,*	T. Davidson, 1859, Mon. Brit. Carb. Brach., p. 50, pl. 10, fig. 1–12.
Spirifer rotundatus,	E. d'Eichwald, 1860, Lethæa Rossica, I, p. 718.
,, *pinguis,*	*Idem*, 1860, *ibid.*, I, p. 719.
Spirifera ,,	T. Davidson, 1860, Mon. Carb. Brach. Scotland, p. 20, pl. 1, fig. 28.

This shell can acquire large dimensions, but varies greatly in its form, its proportions, and its degree of convexity. It is nearly always transverse, sometimes nearly as long as broad, and very rarely longer than broad. Its hinge-line is shorter than its transverse diameter; its cardinal angles are generally rounded. The ventral valve is a little less deep than the dorsal valve; its beak is rather thick, decidedly recurved and prominent. The hinge area is narrow and curved, and its deltoid fissure is partly covered by a pseudo-deltidium; its broad and shallow ventral furrow usually shows rudimentary, longitudinal folds. The dorsal ridge is very broad but little elevated, and generally divided into two parts by a longitudinal groove, which in rare cases proceeds from the very top of the beak. The lateral parts of the valves are ornamented with slightly-raised folds, varying in number from sixteen to twenty; sometimes these folds branch into two at some distance from the margin, thus again modifying the number. Two well-preserved casts (Pl. XIV, Fig. 2 and 2*b*) have shown me that the dental plates are but little developed in this species; the muscular impressions of the ventral valve are not very large, but are marked with fine longitudinal striæ, and round about them are numerous traces of the vascular process. The muscular impressions of the dorsal valve are indistinct, but they are divided by a slight median plate.

Dimensions.—One of the specimens from which I gathered these specific characteristics is about six centimetres long, and nine broad. Another is only about four and a half centimetres long by five and a half broad, with a thickness of twenty-three millimetres.

Relations and Differences.—Mr. T. Davidson was right in following the example of Mr. J. Morris in considering *S. rotundatus* and *S. pinguis*, merely varieties of the same species. The numerous figures given by him strengthen the evidence which proves that one of the varieties insensibly merges into the other, and possesses no distinctive characteristics sufficient to justify their separation. *S. Clarkei* has very much in common with *S. pinguis* especially in the matter of its ornamentation. It is, however, easily distinguished by its elliptical form and by the complete absence of the longitudinal furrow dividing the dorsal ridge of *S. pinguis.*

Horizon and Localities.—*S. pinguis* is one of the most abundant species in the Middle Carboniferous Limestone. It has been found in Belgium at Waulsort by M. Dupont; and is very common at Millecent and Little Island, and at Malahide, Ireland. Mr. W. B. Clarke found it at Glen William and Burragood.

SPIRIFER CONVOLUTUS, *J. Phillips.*

Pl. XII, Fig. 2 and Pl. XIII, Fig. 3.

Spirifera convoluta,	J. Phillips, 1836, Geol. Yorkshire, II, p. 217, pl. 9, fig. 7.
,, *rhomboidea ?*	*Idem*, 1836, *ibid.*, p. 217, pl. 9, fig. 9, 10.
Spirifer convolutus,	L. G. de Koninck, 1843, Descr. Anim. Foss. Terr. Carb. Belg., p. 247, pl. 17, fig. 2.
Spirifera convoluta,	F. M'Coy, 1844, Synop. Carb. Foss. Ireland, p. 130.
,, *avicula,*	G. Sowerby, 1844, In Darwin's Geol. Obs. Volc. Islands, p. 160.
Spirifer ,,	J. Morris, 1845, In Strzelecki's Phys. Descr. N.S. Wales and V. D. Land, p. 282, pl. 17, fig. 6.
Spirifera avicula,	F. M'Coy, 1847, Ann. Mag. Nat. Hist., XX, p. 233.
Spirifer vespertilio,	J. D. Dana, 1849, Geol. Wilkes' U. S. Explor. Exped., p. 685, pl. 2, fig. 3.
,, *convolutus,*	L.-G. de Koninck, 1859, Mem. Soc. Roy. Sci., XVI, p. 30, pl. 2, fig. 7 and 8.

Spirifera convoluta, T. Davidson, 1859, Mon. Brit. Carb. Brach., p. 35, pl. 5, fig. 9–15 (fig. 12 exclusis) and pl. 50, fig. 1, 2.

,, *convoluta?* R. Etheridge, Senior, 1872, Quart. Journ. Geol. Soc., XXVIII, p. 335, pl. 17, fig. 3.

This is a fusiform shell, three or four times as broad as long. Its hinge area is very long, with sub-parallel margins, and occupies the entire length of the shell; its deltoid fissure is rather broad and partly recovered by a pseudo-deltidium. The ventral valve is a little deeper and more ventricose than the dorsal valve; its beak, thick and much recurved, hides part of the deltoid fissure; the ventral furrow varies very much in breadth and depth, but corresponds to the sometimes much-elevated dorsal ridge. Both the dorsal ridge and the ventral furrow are ornamented with five or six longitudinal folds, rather less distinct than those on the rest of the surface. The lateral folds, sixteen or twenty on each side, are oblique, often bifurcated, and scarcely visible towards the lateral margins. The internal casts are very remarkable, and without the external impressions (which have enabled me to determine the species with certainty) it would have been difficult to refer the specimen to its species. This impression, from which I have taken my figure (Pl. XII, Fig. 2), leaves me in no doubt as to its origin; it has evidently been produced by a shell of large size, which, in disappearing, has left in the rock all the details of its ornamentation. The internal casts compared with the external impression show that the shell is rather thick, and the muscular impressions are strong and deeply hollowed into the shell. On each side of these impressions the internal surface shows a number of small irregularly-arranged pits, which are reproduced in relief on the mould; these are generally less pronounced on the dorsal valve, and many specimens are deprived of them.

Dimensions.—The dimensions of this species are very variable. The largest specimen is about fifteen centimetres broad, and four centimetres long.

Horizon and Localities.—Professor Phillips, who first described this species, found it in the Upper Limestone at Bolland. I have found it in limestone of the same age at Visé. M. E. Dupont found it in the Middle Limestone at Pauquys, where it is rather abundant. For some time the casts, found in the Carboniferous beds of Tasmania and Australia, were called *S. avicula,* and were described under that name by Messrs. Sowerby and Morris. The Rev. W. B. Clarke has sent me a large number from Muree Quarry, Russell's Shaft, Anvil Creek, S. Heliers, Mount Wingen, Ællalong, Wollongong, Mt. Gimbela, and from railway cuttings between Maitland and Stony Creek. Mr. McCoy found it in the limestone of Black Head; and Mr. J. Morris from that of Eagle-hawk Neck, Tasmania.

SPIRIFER VESPERTILIO, *G. Sowerby*.[1]

Pl. XIII, Fig. 4 and Pl. XIV, Fig. 8.

Spirifera vespertilio,	G. B. Sowerby, 1844, In Darwin's Geol. Obs. Volc. Islands, p. 160.
„ „	J. Morris, 1845, In Strzelecki's Phys. Descr. N. S. Wales and V. D. Land, p. 282, pl. 17, fig. 8 (fig. 1 and 2 exclusis).
„ „	McCoy, 1847, Ann. Mag. Nat. Hist., XX, p. 282.
„ „	R. Etheridge, Senior, 1872, Quart. Journ. Geol. Soc. XXVIII, p. 329, pl. 16, fig. 2.
Spirifer phalæna,	J. D. Dana, 1849, Geol. Wilkes' U. S. Explor. Exped., p. 685, pl. 2, fig. 4.

This shell is sub-triangular, and transverse, having its greatest breadth at the hinge area, or sometimes just below it, especially in those specimens with slightly rounded ears. The ventral valve is regularly curved; its beak, though rather thick, is moderately recurved, and does not cover the hinge area. The hinge area is concave and somewhat triangular. The ventral furrow is not very broad, and is divided centrally by a rib rather thinner than those bounding the furrow. There are from eight to ten radiating, very angular, lateral folds, sharply separated by furrows of the same breadth; as these folds recede from the ventral furrow they become slightly thicker. The dorsal valve is a little shallower than the ventral valve; its dorsal ridge is divided by a central groove corresponding to the mid-rib of the ventral furrow; its lateral folds are like those of the ventral valve. The entire surface of the shell is ornamented by numerous concentric striæ, rather deeply marked on well preserved specimens, and giving rise to thin imbricated plates. By these plates this species allies itself to *S. laminosus*, McCoy; they are well described and figured by Mr. J. Morris in Strzelecki's work mentioned in the list of synonyms. The internal structure of the valves is very similar to that of the preceding species, but the muscular impressions are less developed, and the cardinal process is less strong than in this last.

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[1] [Mr. R. Etheridge, Junr., considers de Koninck was in error in referring the subjects of his t. 13, f. 4b and 4c, and, perhaps, also his t. 14, f. 3 to G. B. Sowerby's species. He proposes for these forms the name *Spirifera Stutchburii*. Geol. and Pal. Q'land., 1892, p. 231, 232, t. 38, f. 4–6. Compare also Waagen, Pal. Indica, Salt Range Fossils, IV, Pt. 2, 1891, p. 130, t. 5, f. 10*a*, *b*, *c*.—W.S.D.]

Dimensions.—Most of the specimens are about five centimetres wide, and three centimetres long and thick.

Relations and Differences.—Mr. J. D. Dana rightly separated this from the preceding species, with which it has sometimes been confounded, through the similarity of their internal casts. This species differs from *S. convolutus*, by the simplicity of its folds, by the form of its dorsal ridge and ventral furrow; also by the little concentric lamellæ which cover its surface. It differs from *S. laminosus*, McCoy, in the median rib which divides the mesial fold and in the groove of its dorsal ridge, also in its more robust cardinal process, and the greater development of its muscular impressions. I could not keep for it the name given by Dana, on account of the complication that would result from it. It is possible that the unnamed specimen in Fig. 3, Pl. 3, Mr. Dana's (Pl. III, Fig. 3), represents merely a young individual of the same species.

Horizon and Localities.—This species is nearly always associated with the preceding, and is found in the same strata and the same localities, except Wollongong and Mount Gimbela. It is rather abundant.

SPIRIFER LATUS, *F. McCoy.*[1]

Spirifera lata, F. McCoy, 1807, Ann. Mag. Nat. Hist., XX, p. 233, pl. 13, fig. 7.

This is a transverse, subrhomboidal shell, nearly four times as broad as long, but not thick; its cardinal extremities are very acute, and its hinge area wide and flat. The ventral furrow is very long, and the bottom of it slightly angular. On each side of the ventral furrow there are from sixteen to eighteen narrow, rounded, lateral folds, separated from each other by shallow furrows. Towards the extremities of the ears these folds gradually disappear, and leave a nearly smooth triangular space. Except some irregular lines of growth, no other ornamentation is visible on the ventral valve which is the only one known to me.

Dimensions.—The specimen figured by McCoy was about two and a half centimetres long by nine broad. The one I have described is fifteen millimetres long by fifty broad.

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[1] [*Vide* R. Etheridge, Junr., Geol. and Pal. Q'land., 1892, p. 229; A. H. Foord, Geol. Mag., 1890, VII (3), p. 145, t. 6.—W.S.D.]

Relations and Differences.—This species differs from *S. convolutus*, J. Phillips, by the simplicity of its ventral furrow, and of its lateral folds, also by the form of its internal cast, which by the slight development of its muscular impressions resembles *S. mosquensis*, Fischer, much more than *S. convolutus*, J. Phillips. It cannot be confounded with my *S. Rœmerianus*, on account of its size, the length of its area, and the absence of imbricated plates which cover the surface of this last.

Horizon and Localities.—This *Spirifer* has been found in the hard shales of Lewin's Brook by Mr. McCoy; and in those of Colocolo by the Rev. W. B. Clarke.

SPIRIFER TRIANGULARIS, *W. Martin.*

Pl. XIV, Fig. 4.

Conchyliolithus anomites triangularis,	W. Martin, 1809, Petrif. Derbiensis, p. 10, pl. 36, fig. 2.
Spirifer triangularis,	J. Sowerby, 1827, Min. Conch., VI, p. 120, pl. 62, fig. 5, 6.
„ „	Fleming, 1828, Brit. Animals, p. 374.
„ *triangularis ?*	J. Phillips, 1836, Geol. Yorkshire, II, p. 217, pl. 9, fig. 12.
„ „	L. v. Buch, 1837, Ueber Delthyris, p. 37.
„ „	*Idem*, 1840, Mém. Soc. Géol. France, IV, p. 182, pl. 8, fig. 5.
„ „	L. G. de Koninck, 1843, Descr. Anim. Foss. Terr. Carb. Belg., p. 236, pl. 15, fig. 1.
Spirifera ornithoryncha,	F. McCoy, 1844, Synop. Carb. Foss. Ireland, p. 133, pl. 21, fig. 2.
Spirifer triangularis,	P. v. Semenow, 1854, Ueber Foss. Schles. Kohlenkalkes, p. 30.
Spirifera ornithoryncha,	McCoy, 1855, Brit. Pal. Foss., p. 418, pl. 3D, fig. 27.
„ *triangularis*,	T. Davidson, 1859, Mon. Brit. Carb. Brach., pp. 27 and 223, pl. 5, fig. 16–24 and pl. 50, fig. 10–17.

This shell varies greatly in its shape; generally it is much broader than long, while very occasionally its length equals its breadth. The only specimen sent me from Australia happens to be an example of this last, and consists merely of a ventral valve. This valve is subtetragonal, with slightly-rounded angles. It is small; its proportionately broad and deep ventral furrow shows, towards its base, the mesial fold which characterises the species, and which often projects beyond the frontal margin. The ventral furrow is limited by two, rather thick, rounded lateral folds, on the sides of which are three smaller folds. The number of these folds is usually greater than in this specimen, and may vary from six to ten; but, in spite of this variation, I have no doubt that it is identical with the species first described by Martin, because I have seen it in all its modifications in the Visé Limestone. The surface is ornamented with some lines of growth.

Dimensions.—The specimen I have just described is only fifteen millimetres long, and about as broad; it is precisely like that I have figured in Pl. XV, Fig. 1^d and 1^e, in my "Descriptions des Animaux Fossiles."

Horizon and Localities.—This species is generally rare, and belongs to the upper beds of the Carboniferous Limestone. It has been found at Buxton, Settle, Bolland, and Kirkby-Lonsdale, in England, and at Millecent in Ireland. I found it at Visé, and Mr. W. B. Clarke found it in a compact ferruginous limestone at Stroud, where it is associated with a large number of fragments of *Terebratula sacculus*, Martin, some of which have preserved their perforated structure.

SPIRIFER BISULCATUS, *J. Sowerby*.[1]

Pl. XIV, Fig. 5.

Anomiæ striatæ,	Ure, 1793, Hist. Rutherglen, p. 314, pl. 15, fig. 1.
Terebratula,	1797, Encycl. Meth., pl. 244, fig. 5.
Spirifer trigonalis,	J. Sowerby, 1820, Min. Conch., III, p. 17, pl. 23, fig. 2, 3 (non W. Martin).
,, *bisulcatus,*	J. de C. Sowerby, 1825, *ibid.*, V, p. 152, pl. 413, fig. 23.
Spirifera bisulcata,	T. Davidson, 1857, Mon. Brit. Carb. Brach., p. 31, pl. 4, fig. 1? pl. 5, fig. 1, pl. 6, fig. 1–19 and pl. 7, fig. 4.
Spirifer bisulcatus,	L.-G. de Koninck, 1872, Rech. Anim. Foss., II, p. 61, pl. 2, fig. 6, 7 (for synonymy).
Spirifera allied to *S. bisulcata,*	R. Etheridge, Senr., 1873, Quart. Journ. Geol. Soc., XXVIII, p. 335, pl. 17, fig. 2.

This shell, which can attain rather large dimensions, is generally broader than long, and oval or subrhomboidal according as its hinge area is more or less extensive. Both valves are regularly curved and nearly of the same depth; their cardinal extremities are rounded or angular, and in the latter case a little depressed; their beaks are so strongly recurved as nearly to meet each other; the hinge-area is moderately raised, its surface is curved, and it has a broad deltoid fissure partly covered by a pseudodeltidium. The ventral furrow is shallow, and united to the sides by a regular curve of the shell; it is ornamented with from four to eight rather thin, longitudinal ribs, rarely bifurcating. The dorsal ridge is more distinctly limited than the ventral furrow, and its surface is regularly rounded, except for the ribs with which it is ornamented. Both valves are covered with a variable number of radiating, generally rounded, rarely angular, lateral folds. In young specimens most of these folds are simple, while in adults the two or three folds adjoining the ventral furrow and the dorsal ridge are bifurcated. In well-preserved specimens the surface ornamentation is seen to consist of fine lines of growth crossed at right angles by radiating striæ, thus producing a fine reticulated design, invisible to the naked eye. The spiral supports are twisted so as to produce a rather elliptic cone; the muscular impressions are small, and offer no special point of interest.

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[1] [*Spirifera trigonalis*, Martin, var. *bisulcata*, J. de C. Sby. R. Etheridge, Junr., Geol. and Pal. Q'land., 1892, p. 230, t. 9, f. 15.—W.S.D.]

Dimensions.—The dimensions of this species being very variable, I will give those of the best Australian specimen. The length of this is thirty-six millimetres, the breadth fourteen, and the thickness about twenty.

Relations and Differences.—This species cannot easily be distinguished from its congeners owing to the extent of its variations. It needs some experience to avoid confounding it with *S. mosquensis*, Fischer, and *S. striatus*, Martin, the folds of which are more regular and more numerous in the first, and much more divided in the second.

Horizon and Localities.—This species is very abundant in the upper beds of the Carboniferous Limestone at Visé, also in Yorkshire, Scotland, and Ireland. It has been found at Bleiburg in Carinthia. Mr. Clarke found it in Muree Quarry, at Branxton, St. Heliers, Mulbring Creek, Ællalong, Burragood, Colocolo, Cedar Brush, and in the neighbourhood of Tilleghary, and Jervis Bay. Few Carboniferous fossils in Australia occupy so extensive a horizontal position as this one. Mr. Etheridge records with doubt its occurrence at Bowen River, Queensland.

SPIRIFER TASMANIENSIS, *J. Morris.*[1]

Pl. IX, Fig. 7.

Spirifera rotundata,	G. B. Sowerby, 1844, In Darwin's Geol. Obs. Volc. Islands, p. 159 (non J. Sowerby).
Spirifer Tasmaniensis,	J. Morris, 1845, In Strzelecki's Phys. Descr. N. S. Wales and V. D. Land, p. 280, pl. 15, fig 3, 4.
Spirifera ,,	F. M'Coy, 1847, Ann. Mag. Nat. Hist., XX, p. 233.
Spirifer Tasmanni,	L. v. Buch, 1847, Ueber Spirifer Keilhavii, p. 11, fig. 3.

This is a moderate-sized, transversely oval shell. Its ventral valve is rather convex, and deeper than the dorsal valve; its beak is strongly recurved, partly covering the deltoid fissure; the hinge area is flat, with subparallel edges, extending across the whole breadth of the valve; the ventral furrow is evenly hollowed into the form of a canal, and ornamented with from eight to ten small, simple, longitudinal ribs multiplying by insertion on each side of the furrow. The dorsal valve, the lateral portions of which are slightly depressed, has a very prominent dorsal ridge, ornamented with ribs exactly like those of the ventral furrow. Some broader, radiating, lateral folds, from ten to twelve in number, ornament both valves; these folds, simple at first, bifurcate or trifurcate at some distance from their origin, and at variable distances are broken by concentric lines of growth, making them appear more or less imbricated. The edge is sharp; the test rather thin, nacreous, and fibrous in substance. The spiral supports, traces of which remain on the internal casts, have the form of an elongated cone produced by eighteen or twenty turns of the lamella.

Dimensions.—These have been taken from an almost perfect specimen; length thirty-five, breadth forty-eight, and thickness twenty-two millimetres.

Relations and Differences.—From the form of its lateral folds, this species strongly resembles *S. duplicicosta,* Phillips, also certain varieties of *S. striatus,* Martin; but it differs from the first by the form and length of its hinge-area, and from the second by the very distinct boundaries of its ventral furrow and dorsal ridge, also by the shape and regularity of the folds covering the furrow and ridge.

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[1] [*Spirifera tasmaniensis.* R. Etheridge, Junr., Geol. and Pal. Q'land., 1892, p. 232, t. 10, f. 1, ? f. 15.—W.S.D.]

Horizon and Localities.—Of the typical specimens, on which Mr. J. Morris established the species, some come from the Eastern Marches and Mount Wellington, Tasmania, and others from Illawarra and Raymond Terrace, N. S. Wales. Mr. W. B. Clarke found specimens of it at Mount Wingen, and Coyeo on the Page River, at Korinda, Aellalong, and Nowra Hill.

SPIRIFER EXSUPERANS, *L. G. de Koninck.*[1]

Pl. XV, Fig. 1.

This shell is transverse, subpyramidal, about one-third broader than long, and terminates in a point at each extremity. The dorsal valve is semi-elliptical and shallow; the dorsal ridge is simple, very convex, and broad towards its frontal extremity; the beak is very elevated, slightly recurved, and pointed; the hinge-area is very large and high, and extends across the whole breadth of the valve; the deltoid fissure is broad and its height exceeds half the breadth of its base. This fissure is closed in its upper part near the beak by a small pseudodeltium. Both sides of the surface of the shell are ornamented with from fifteen to eighteen radiating, simple folds, rounded and separated by shallow furrows. In its internal structure this species is rather remarkable, and in no way resembles that of the *Syringothyris cuspidatus,* W. Martin, with which I at first confounded it. Two strong, diverging, dental plates occupy the bottom of the ventral valve, by which the framework is perfectly consolidated; between these diverging plates (which do not extend beyond half the length of the valve), and immediately below their junction, is the central impression of the adductor muscle; this impression, in the shape of a lozenge, is longitudinally plicated, and flanked by two rather deep cardinal impressions striated lengthways. The rest of the shell shows irregular, oblique furrows, probably depending from the vascular process. The internal part of the hinge area shows some small rounded pits, not very regular either in shape or arrangement. The interior of the dorsal valve is unknown to me.

Dimensions.—The length is about two, and the breadth eight, centimetres; the terminal angle of the beak is 130°; the height of the hinge area, twenty-one millimetres; and the breadth of the deltoid fissure, at the base, fourteen millimetres.

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[1] [*Syringothyris exsuperans,* de Koninck. A. H. Foord, Geol. Mag., 1890, VII (3), p. 149, 153; R. Etheridge, Jun., Records Geol. Survey N. S. Wales, 1897, V, Pt. 2, pp. 43–48, t. 6.—W.S.D.]

Relations and Differences.—This species bears a great resemblance to *S. subcuspidatus*, J. Hall; nevertheless it differs in several important characteristics. First, its length is less; then, the beak of the ventral valve is much more recurved; and again, the angle of the apex is about 130°, while that of *S. subcuspidatus* is only about 110°.

Horizon and Localities.—This species was found in the dolomite of Glenwilliam and Colocolo.

Genus—SPIRIFERINA.

SPIRIFERINA CRISTATA, *v. Schlotheim.*

***Terebratulites cristatus*,**	Von Schlotheim, 1816, Schriften K. Baier. Akad. Wissen. München, VI, pl. 13, fig. 3.
***Spirifer octoplicatus*,**	J. Sowerby, 1827, Min. Conch., VI, p. 119, pl. 562, fig. 2, 3, 4.
„ ***cristatus*,**	L. v. Buch, 1837, Ueber Delthyris, p. 39.
„ „	*Idem*, 1840, Mém. Soc. Géol. France, IV, p. 185, pl. 8, fig. 9.
„ „	L.-G. de Koninck, 1843, Descr. Anim. Foss. Terr. Carb. Belg., p. 240, pl. 15, fig. 5.
***Spirifera octoplicata*,**	F. McCoy, 1844, Synop. Carb. Foss. Ireland, p. 133.
***Spirifer octoplicatus*,**	A. d'Orbigny, 1850, Prod. Pal., I, p. 125.
„ „	L.-G. de Koninck, 1851, Descr. Anim. Foss. (Suppl.), p. 658.
***Spirifera octoplicata*,**	F. McCoy, 1855, Brit. Pal. Foss., p. 418.
***Spiriferina cristata*, var. *octoplicata*,**	T. Davidson, 1857, Mon. Brit. Carb. Brach., pp. 38 and 267, pl. 7, fig. 37–47, and pl. 54, fig. 10, 12.
„ „	*Idem*, 1860, Mon. Carb. Brach. Scotland, p. 23, pl. 1, fig. 36–38.
„ „	J. W. Dawson, 1868, Acad. Geol., p. 292, fig. 90.

This is a small, transverse, sub-rhomboidal shell, sometimes a little gibbous, having its greatest breadth at the hinge line. Its cardinal angles are often slightly rounded at their extremities. The ventral valve is scarcely deeper than the dorsal valve; its beak is small and very little recurved; its hinge area is concave, triangular, and rather variable in length; its deltoid fissure is partly recovered by a pseudo-deltidium; its ventral furrow is deep, acute at the bottom, and usually simple. The dorsal ridge is generally formed of a single angular fold rather more pronounced than the adjacent folds, but towards its frontal extremity there are two rudimentary folds causing an equally rudimentary fold at the frontal edge of the ventral furrow. Both valves possess from eight to twelve angular folds, by which the whole surface, including the ventral furrow and the dorsal ridge, is covered with thin, concentric, imbricated plates. The test is perforated, and consequently covered with an immense number of small asperities. In the centre of the ventral valve is a septum generally more developed in proportion than in most of the other species of *Spirifer*, among which it is often only rudimentary.

Dimensions.—These are very irregular. The length rarely exceeds fifteen millimetres, and the breadth twenty-five millimetres.

Relations and Differences.—It is now generally agreed that the Carboniferous species figured by Sowerby under the name *S. octoplicatus*, is identical with the Permian species first described by von Schlotheim under the name *Terebratulites cristata*. This was my opinion in 1843, and it was a mistake to abandon it later on as I did. This *Spirifer* is easily distinguished from the following species by being more transverse, and by having more folds.

Horizon and Localities.—As this species recurs after, and has survived, the deposition of the Carboniferous rocks, it is easy to suppose that it belongs essentially to the upper beds of that System. I have found it frequently in the Visé Limestone; and it occurs in Derbyshire, Yorkshire, Scotland, and Ireland. Mr. W. B. Clarke found a single specimen of it in a quartzose sandstone at Colocolo.

SPIRIFERINA INSCULPTA, *J. Phillips.*

Spirifera insculpta,	J. Phillips, 1836, Geol. Yorkshire, II, p. 216, pl. 9, fig. 2, 3.
Spirifer crispus,	L.-G. de Koninck, 1843, Descr. Anim. Foss. Terr. Carb. Belg., p. 257, pl. 15, fig. 7, 8 (non Linnæus).
Spirifera quinqueloba,	F. McCoy, 1844, Synop. Carb. Foss. Ireland, p. 134, pl. 22, fig. 7.
,, ,,	Von Semenow, 1854, Ueber die Foss. Schles. Kohlenkalkes, p. 14.
Spiriferina ? insculpta,	T. Davidson, 1857, Mon. Brit. Carb. Brach., p. 42; pl. 7, fig. 48–55.
Spirifer insculptus,	E. d'Eichwald, 1860, Lethæa Rossica, I, p. 709.
Spiriferina insculpta,	T. Davidson, 1860, Mon. Carb. Brach. Scotland, p. 24, pl. 1, fig. 35.

This is a small, sub-rhomboidal, slightly transverse shell, with a straight hinge line occupying the greatest breadth of the valve. The hinge area is large, triangular, and nearly flat, the deltoid fissure is rather large, and the beak small, pointed and slightly recurved. Both valves are nearly equally convex. The dorsal valve is usually ornamented with five, rarely with seven, angular folds, of which the central fold representing the dorsal ridge is a little more pronounced than the others, and corresponds to the ventral furrow. The ventral valve has six folds like those of the dorsal valve. The whole surface is furnished with fine concentric, imbricated plates, and the shell is perforated.

Dimensions.—The length is four, the breadth five, and the thickness three, millimetres.

Relations and Differences.—This species differs from the preceding by its less curved form, and the development of its hinge area, also by the small number and the arrangement of its folds. It bears some resemblance to that *Spirifer* of the Tournai Limestone which I at first confounded with *S. heteroclytus*, Defrance, and which is figured by d'Orbigny under the name *S. Koninckianus* in his " Prodrôme de Paléontologie." This *Spirifer* which Mr. T. Davidson mistook for this species differs from it by being shallower, and above all by the complete absence of the concentric plates which cover the surface of *S. insculptus*, plates which are replaced by undulations of growth.

Horizon and Localities.—This species usually accompanies the preceding, and like it belongs principally to the upper beds of the Carboniferous Limestone. A single specimen of it was found by Mr. W. B. Clarke in a brown, compact, ferruginous limestone at Colocolo. I have given the dimensions of this.

Genus—CYRTINA, *T. Davidson.*

CYRTINA SEPTOSA, *J. Phillips.*

Pl. XV, Fig. 2.

Spirifera septosa, J. Phillips, 1836, Geol. Yorkshire, II, p. 216, pl. 9, fig. 7.

Spirifer subconicus, L.-G. de Koninck, 1845, Descr. Anim. Foss. Terr. Carb. Belg., p. 255, pl. 12 bis, fig. 5 (non Martin).

Cyrtina septosa, T. Davidson, 1857, Mon. Brit. Carb. Brach., p. 68, pl. 14, fig. 1–10, and pl. 15, fig. 2.

This shell is transverse, and more or less rhomboidal according to the age of the individual. The hinge line occupies the greatest breadth of the valves. The ventral valve is slightly curved, and has a shallow ventral furrow, well defined on each side by a fold rather thicker and more projecting than the six or seven folds which ornament the ventral furrow itself; its hinge area is very large, triangular, slightly concave, with a deltoid fissure proportionately large; its beak is nearly straight and not prominent. The dorsal valve is sub-semicircular, convex, with a slightly projecting dorsal ridge, and ornamentation corresponding to that of the ventral furrow. The rest of the surface is covered with folds like those in the centre of the valves, varying in number with the individual; these folds increase either by interposition or by simple bifurcation, and are crossed by irregular lines of growth, often deep enough to produce imbricated plates. The inside of the ventral valve is furnished with two large, vertical, contiguous plates, which diverge as they recede from the beak towards the margin of the shell, and become re-united, and then again separate, one going to the right and the other to the left, thus forming the dental plates. The interior of the dorsal valve is unknown to me.

Dimensions.—The only specimen sent me is five centimetres long by eight broad. The elevation of its axis is about 2·5 centimetres.

Relations and Differences.—In 1843 I confounded this species with *S. subconicus*, Martin, which it resembles only in the elevation of its area. I perfectly recognised this error later on, and have tried to repair it by furnishing my learned friend Mr. Davidson with the materials I had the opportunity of collecting. It is not impossible that *Cyrtina dorsata*, McCoy, is only a variety of *C. septosa.*

Horizon and Localities.—In Belgium, this species occurs only in the upper beds of the Carboniferous Limestone, at Visé, but it is very rare, only a few examples having been found, some of which are in the Royal Natural History Museum of Brussels. It is equally uncommon in England, where J. Phillips first discovered it at Ribblehead and Bartonhall, in Cumberland; since then it has been found at Park Hill, Longnor, in Derbyshire; and at Settle, in Yorkshire. Mr. W. B. Clarke found a specimen of it in a light grey lime-stone on the Murrumbidgee, near Yass, probably having been brought a great distance by the waters of that river.

Genus—TEREBRATULA, *Lhwyd.*

TEREBRATULA SACCULUS, *W. Martin.*[1]

Pl. XV, Fig. 3, 4, and 5.

Conchyliolites anomites sacculus,	W. Martin, 1809, Petrif. Derbiensis, p. 14, pl. 46, fig. 1, 2.
Terebratula sacculus,	J. de C. Sowerby, 1824, Min. Conch., V, p. 65, pl. 446, fig. 1.
„ ***hastata,***	*Idem*, 1824, *ibid.*, p. 66, pl. 446, fig. 2, 3.
„ „	J. Morris, 1845, In Strzelecki's Phys. Descr. N. S. Wales and V. D. Land, p. 278.
„ ***cymbæformis,***	*Idem*, 1845, *ibid.*, p. 278, pl. 17, fig. 4, 5.
Atrypa cymbæformis,	F. McCoy, 1847, Ann. Mag. Nat. Hist., XX, p. 231.
„ ***biundata,***	*Idem*, 1847, *ibid.*, p. 231, pl. 13, fig. 9.
Terebratula amygdala,	J. D. Dana, 1849, Geol. Wilkes' U.S. Explor. Exped., p. 682, pl. 1, fig. 2.
„ ***elongata,***	*Idem*, 1849, *ibid.*, p. 682, pl. 1, fig. 3.
„ ***?***	*Idem*, 1849, *ibid.*, p. 683, pl. 1, fig. 5.
„ ***sacculus,***	T. Davidson, 1867, Mon. Brit. Carb. Brach, p. 14, pl. 1, fig. 23, 24, 27, 29, and 30.
„ ***hastata,***	*Idem*, 1837, *ibid.*, p. 12, pl. 1, fig. 1–12.
„ „	*Idem*, 1862, *ibid.* (Appendix), p. 212, pl. 49, fig. 11–30.
„ ***sacculus,***	J. W. Dawson, 1868, Acad. Geol., p. 289, fig. 87.
„ „	L.-G. de Koninck, 1872, Rech. Anim. Foss., II, p. 65, pl. 2, fig. 16 (for synonomy of the species).
„ ***bovidens,***	F. B. Meek and A. H. Worthen, 1873, Geol. Pal. Illinois, V, p. 572, pl. 25, fig. 5.
„ ***hastata,***	F. Roemer, 1876, Lethæa Pal., pl. 13, fig. 5.

There have been no recent modifications in the distinguishing characteristics of this species, and I must therefore content myself with repeating what I said of it in 1872 in my "Monographie des Fossiles carbonifères de Carinthie." This species is very variable in form and size; its principal varieties were for a long time considered distinct species, and were successively described, after W. Martin, as follows:—*T. hastata*, by J. Sowerby; *T. bovidens*, by Morton; *T. vesicularis* and *T. hastæformis*, by myself; *T. cymbæformis*, by J. Morris; *T. amygdala*, by J. D. Dana; *T. fusiformis*, by E. de Verneuil; *T. Gillingensis*, by T. Davidson, &c.

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[1] [Mr. R. Etheridge, Junr., is of opinion that *Dielasma cymbæformis*, Morris, here classed by De Koninck as a synonym of *D. sacculus*, is a valid species. Geol. and Pal. Q'land., 1892, p. 225, t. 9, f. 10, 11.—W.S.D.]

Leopold de Buch was the first to admit that all the varieties figured under these different names were of one and the same specific type, and were connected by such insensible gradations that it is difficult to define them. The same opinion was given by me in 1843, and by E. de Verneuil in 1845. It was after long hesitation, and after comparing a considerable number of specimens from different countries and localities, that my learned friend Mr. T. Davidson accepted the same view. I must, however, mention that, in some localities, one or other of these varieties affects a constant dominant form, so that there is little wonder that it should so long have been considered a distinct species. Thus, for example, the typical form figured by W. Martin, is chiefly found, and often in great abundance, in the Upper Carboniferous beds of Visé and Namur, Belgium, of Settle and Bolland, England, of Glasgow, Scotland, and of Cork, Ireland. It is much less frequent in the middle beds, as at Waulsort, near Dinant; and it is nearly completely replaced by the variety *T. hastata*, or forms approaching it, in the lower beds of Tournai, Belgium, Hook Point, Ireland, and Burlington, America. Although both of the chief varieties are represented in Australia the *T. hastata* predominates, and is most frequently met with. It is in this variety that *T. cymbæformis*, J. Morris, and *T. bi-undata*, McCoy, ought to be placed. In order to render the definition of the species more correct, and to facilitate its exact determination, I have figured the principal varieties found by Mr. Clarke, and, like Mr. Davidson, I have described them separately.

Variety 1, having for its type:

TEREBRATULA SACCULUS, *Martin*.

Pl. XV, Fig. 5.

This is usually rather small, oval or sub-pentagonal, a little longer than broad, with folded front; its valves are nearly equally convex. The ventral valve is supplied with a ventral furrow very pronounced towards its frontal extremity, while its dorsal valve is only slightly impressed in the corresponding part. The surface is smooth, or simply ornamented with a few concentric wrinkles of growth near the margins. When the frontal sinuosity is very strongly pronounced the front is folded so as to produce a design rather like a capital W, with slightly rounded angles. In 1851 I gave the name *T. vesicularis* to this form; and Morton has figured it under the name *T. bovidens.*

Horizon and Localities.—Among the Australian fossils I found only two specimens of this variety; one comes from Burragood, and the other from Stroud, where it is associated with *S. trigonalis*, Martin.

Variety 2, having for its type:

TEREBRATULA HASTATA, *Sowerby.*[1]

Pl. XV, Fig. 3.

This variety is generally elongated and oval, with a rounded or slightly sinuous front. The valves are more or less convex, equally deep, and rarely having sharp edges. The ventral valve is generally slightly depressed or sinuous towards the front; in some specimens this depression extends higher and reaches almost the half of the total length of the valve; its beak is rather thick, and though recurved, rises perceptibly above that of the dorsal valve; the extremity of the beak is truncated rather obliquely, and pierced by a large, rarely circular foramen, the lower part of which is continued in the form of a small canal beyond the beak of the dorsal valve; its deltidium is very small and scarcely perceptible on most of the specimens; in the interior are two diverging hinge teeth. The interior of the dorsal valve is ornamented with an apophysis like that of living *Terebratulidæ*, and which scarcely extends beyond one-third of the length of the shell. The whole external surface is smooth, or simply ornamented with undulations, as in the variety *T. cymbæformis*, or with concentric rings of growth, as in *T. hastata* properly so called. The shell is perforated, but the perforations are extremely small, and rather regularly arranged quincuncially. In the Australian specimens I have noticed no traces of colouration such as some European specimens show.

Horizon and Localities.—According to McCoy this species is common in the sandstone at Muree, Raymond Terrace, where it was found by Messrs.

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[1] [*Dielasma sacculus*, var. *hastata*, J. de C. Sby. R. Etheridge, Junr., Geol. and Pal. Q'land., 1892, p. 226.—W.S.D.]

Strzelecki and W. B. Clarke. Mr. W. B. Clarke found it near Stroud on the Karua, in the Ichthyodorulite Range, between the Hunter and Rouchel Rivers. Messrs. Dana and McCoy have also found it in the Illawarra District.

Division—MOLLUSCA.

Class—LAMELLIBRANCHIATA.

Genus—SCALDIA, *de Ryckholt.*

1. SCALDIA ? DEPRESSA, *L. G. de Koninck.*

Pl. XV, Fig. 6.

This is a slightly transverse shell, a very little broader than long, sub-oval, and much depressed anteriorly. Its beaks are very small, and placed a little in front of the centre of the hinge line. The edges are sharp; the anterior is semi-elliptical, while the posterior is slightly truncated. The posterior part of the valve is distinctly separated from the anterior and middle parts by a depression originating at the beaks, and passing towards the ventral margin, crossing the shell obliquely. The test is very thin; its surface is ornamented only with fine concentric lines of growth.

Dimensions.—The length is thirty-four, the breadth sixteen, and the thickness eight, millimetres.

Relations and Differences.—This species is easily distinguished from its congeners by its thinness. The only specimen supplied me showed the impression of the hinge, and thus allowed me to state its genus with certainty.

Horizon and Localities.—It was found in a greyish sandstone at Buchan on the Gloucester.

SCALDIA ? LAMELLIFERA, *L. G. de Koninck.*

Pl. XV, Fig. 7.

This shell is small, very nearly orbicular, depressed, with small, straight beaks placed nearly in the middle of the hinge line. An oblique depression, commencing at the beak, is perceptible on the posterior part of the valves.

The whole exterior surface is covered with fine, concentric, imbricated lamellæ, easily scaling off. The shell is thin and fragile. I could not see the hinge, but the general form of the shell so perfectly resembles that of the Carboniferous *Scaldia*, of Belgium, that I have little doubt of having determined it correctly.

Dimensions.—The length is thirteen, the breadth twelve, and the thickness six, millimetres.

Relations and Differences.—Of all the species known to me, *S. Omaliusiana*, Ryckholt, most resembles *S. lamellifera*; but it differs by being less depressed, and especially by the folds of its surface not being laminated.

Horizon and Localities.—A single specimen of this species, with both valves extended on the same plane (see my figure), was found in a greenish-grey sandstone at Harpur's Hill.

Genus—SANGUINOLITES, *McCoy.*[1]

SANGUINOLITES UNDATUS, *J. D. Dana.*

Pl. XVII, Fig 1.

Pholadomya (*Platymya*) *undata*, J. D. Dana, 1849, Geol. Wilkes' U. S. Explor. Exped., p. 687, pl. 2, fig. 11.

This shell is of medium size, elongated, elliptical, nearly as thick as broad, with a straight hinge line, and a regularly curved ventral margin; the anterior margin is rounded, while the posterior is slightly and obliquely truncated, and moderately gaping. Its beaks are rather thick, strongly recurved upon themselves, close together, and situated towards the anterior third of the total length of the valves. The valves are regularly vaulted and very deep; their surface is ornamented with numerous concentric undulations of growth; these undulations are only faintly marked on the internal casts, but are more numerous and distinct on the test, which is thin and seldom preserved.

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[1] [Speaking of the Australian Permo-Carboniferous fossils referred to *Sanguinolites* by de Koninck, Mr. R. Etheridge, Junr., says "These are not *Sanguinolites*, as the genus is now restricted." Several of them he refers doubtfully to Meek's *Chænomya*. Geol. and Pal. Q'land., 1892, p. 281.—W.S.D.]

Dimensions.—One of the best specimens sent me measures 8·5 centimetres long, 4·5 broad, and four thick. The distance between the beaks and the anterior margin is about three centimetres.

Relations and Differences.—This species is closely related to *S. clava*, McCoy, from which it differs by its relative proportions, and by the much less anterior position of its beaks.

Horizon and Localities.—Mr. J. Dana found this species at Wollongong Point and Illawarra; Mr. W. B. Clarke at Mount Vincent, and Burragood on the Paterson, in a greyish sandstone.

SANGUINOLITES MITCHELLII, *L. G. de Koninck.*[1]

Pl. XVI, Fig. 8.

This is a moderate-sized, gibbous, inflated, nearly oval shell, only about one-third longer than broad. Its hinge line is almost straight, while its ventral edge is arched and slightly sinuous towards its anterior third; the anterior margin is regularly rounded, while the posterior, which is much larger, has a very irregularly curved outline. The posterior side is decidedly gaping. The beaks are thick, recurved so as nearly to meet, and placed at about the anterior two-fifths of the shell. The whole external surface is covered with irregular concentric wrinkles of growth. The muscular impressions have left scarcely perceptible traces on the internal casts which I have examined.

Dimensions.—The length is six, the breadth three and a half, and the thickness four and a half centimetres; and the distance of the beaks from the anterior margin is eleven millimetres.

Relations and Differences.—This species, which I dedicate to Colonel Mitchell, one of the brave Australian explorers, differs from the preceding by its much smaller size, its gibbosity, and the less central position of its beaks.

Horizon and Localities.—Two specimens of this species were found by Mr. W. B. Clarke, one in a brownish limestone at Ællalong, and the other in a white limestone at Wollongong.

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[1] [Compare *Sanguinolites* cf. *Mitchellii*, Waagen, Salt Range Fossils (Pal. Indica), IV, Pt. 2, 1891, p. 127, t. 5, f. 4a, b, c. W.S.D.]

SANGUINOLITES ETHERIDGEI, *L. G. de Koninck.* (1)

Pl. XVI, Fig. 2, and Pl. XVII, Fig. 2.

This shell is large, very gibbous, elongated, club or wedge-shaped, inflated at its anterior part, and nearly flat at the opposite side. The valves are very deep anteriorly; the beaks thick, strongly recurved, touching each other, and placed very near the anterior margin. The ventral margin is regularly curved like the anterior margin, but the posterior margin is slightly truncated obliquely, and gapes a very little, so as to show an oval and very narrow opening towards that part of the margin which joins the hinge line. The whole surface is ornamented with thick, concentric, wrinkles of growth, rather like each other, and bearing striæ parallel with them. I could find no trace of muscular impressions on the casts of this species.

Dimensions.—The length is eight, the breadth four, the thickness four and a half centimetres, and the distance between the beaks and the anterior margin one centimetre.

Relations and Differences—In dedicating this species to Mr. R. Etheridge, I wish to do homage to the talent with which he treated a subject similar to the one I have in hand, and also to the skill with which he conducts the Palæontological section of the School of Mines, London. This species differs from the preceding by its size, and especially by the anterior position of its beaks. Another specimen sent me was shorter and broader than the one I have just described, but like it in every other respect, so that I consider it a variety of *S. Etheridgei*, it may possibly have been distorted during fossilisation. I have represented it on Pl. XVI, Fig. 2.

Horizon and Localities.—All the specimens come from the Muree sandstone, except the last which was found at Mount Vincent.

SANGUINOLITES McCOYI, *L. G. de Koninck.*[2]

Pl. XVII, Fig. 3.

This shell is rather small, regularly oval, ventricose, nearly twice as long as broad, and exactly as thick as broad, with anterior beaks closely approaching each other. The whole surface is covered with irregular, concentric, wrinkles of growth. The posterior margin seems to gape.

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(1) [*Chænonya? Etheridgei*, De Koninck, sp. R. Etheridge, Junr., Geol. and Pal. Q'land., 1892, p. 279. Procs. Linn. Soc. N.S. Wales, 1895, x (2), Pt. 3, p. 532, t. 40, f. 5. W.S.D.]

[2] [Of this species Mr. R. Etheridge, junr., says "It has the outward appearances of the genus *Allorisma*, King, but without a better knowledge of its internal characters it would not be wise to so refer it. . . ." Geol. and Pal. Q'land., 1892, p. 281.—W.S.D.]

Dimensions.—The length is forty-three, the breadth and thickness twenty-six, millimetres.

Relations and Differences.—This species differs from those preceding by being small and ventricose. It is closely allied to the small variety *S. variabilis*, McCoy (Palæoz. Fossils, Pl. F3, Fig. 7 and 8), which is the same as the Tournai *Sanguinolites* figured by me as *S. omalianus*; it differs from it by the form of its concentric wrinkles, by its relatively greater thickness, and above all by the absence of the depression towards the posterior side. I have dedicated it to the learned Director of the Melbourne Museum, to whom we owe numerous descriptions of the Silurian and Carboniferous fossils of Australia.

Horizon and Localities.—A single specimen was found in the Wollongong sandstone.

SANGUINOLITES CURVATUS, *J. Morris.*

Pl. XVII, Fig. 4.

Allorisma curvatum,	J. Morris, 1845, In Strzelecki's Phys. Descr. N. S. Wales and V. D. Land, p. 170, pl. 10, fig. 1.
,, ,,	F. McCoy, 1847, Ann. Mag. Nat. Hist., XX, p. 300.
Pholadomya (Homomya) curvata,	J. D. Dana, Geol. Wilkes' U.S. Explor. Exped., p. 688, pl. 8, fig. 2.

This is a large, oblong, very inequilateral, gibbous, shell, suboval in contour. Its anterior margin is rounded, its ventral margin slightly sinuous towards its anterior part, and its anal margin obliquely truncated, gaping, and also a little sinuous. The beaks, situated very anteriorly, are inflated, recurved, and very close together. The exterior ligament is very large; the whole external surface is covered with irregular, concentric, wrinkles of growth, crossed by some scarcely perceptible, radiating lines. According to Mr. J. Morris the impression of the posterior adductor muscles is very distinct, while that of the anterior adductors is scarcely visible.

Dimensions.—The length is ten, the breadth eight, and thickness six, centimetres.

Relations and Differences.—This species is easily distinguished from all the preceding by its size, its more rounded form, and by the relations of its different dimensions.

Horizon and Localities.—M. Strzelecki found it at Illawarra; Mr. W. B. Clarke at Mount Gimbela, in a brownish sandstone; and Mr. McCoy says it is abundant in the sandstone of Darlington, Wollongong, and Glendon.

SANGUINOLITES TENISONI, *L. G. de Koninck.*[1]

Pl. XVII, Fig. 5.

This is a small, oblong, elliptical shell, very nearly twice as long as broad, and with the hinge-line and ventral margin sub-parallel. Its valves are rather shallow, and slightly depressed at the anal side. The hinge-line is straight, and occupies nearly two-thirds of the whole length of the shell; the ventral margin is slightly arched, and the valves are rather broader towards their posterior than towards their anterior extremity. The beaks are small, and placed anteriorly at a distance of six millimetres from the exterior margin. The surface is ornamented with ten or twelve sub-equidistant, concentric, wrinkles, all alike, and a little laminated. The valves apparently are not gaping.

Dimensions.—The length is thirty-eight, the breadth eighteen, and the thickness six, millimetres.

Relations and Differences.—In general form this species resembles *S. plicatus*, Portlock, but it differs in breadth, and in the arrangement and small number of its concentric folds. It is possibly identical with *Modiola squamifera*, J. Phillips, which evidently does not belong to the genus in which it is placed; unfortunately I have had no opportunity of comparing it with this species, which seems to be rather rare, and which I have not seen in any collection I have visited.

Horizon and Localities.—A single specimen was found in an argillaceous, olive-coloured, limestone at Burragood. It was associated with *Productus semireticulatus*, Martin, and with numerous fragments of Crinoid stems. It is at the desire of Mr. W. B. Clarke that I have dedicated this species to Mr. J. E. Tenison Woods, who has given himself successfully to the study of Australian geology.

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[1] [Ten. Woods, Journ. R. Soc. N.S. Wales, 1882 [1883], XVI, p. 145, t. 10, f. 9; Waagen, Salt Range Fossils (Pal. Indica), 1891, IV, Pt. 1, p. 128, t. 5, f. 6*a*, *b*, *c*.—W.S.D.]

Genus—CLARKIA, *L. G. de Koninck.*[1]

In this genus, the shell is elongated, equivalved, and gaping at its anal extremity; its ligament (?) is external; its hinge shows a thick callosity, and is composed of a single tooth, projecting a little over each valve, and placed directly under the beak. The external surface is perfectly smooth. The impressions of the adductor muscles and of the foot are separate; the first are large, oval, and not strongly marked, while the other is small and decidedly well-marked. The pallial impression is nearly simple, not very apparent, and only very sinuous posteriorly. The shell is somewhat thick, and its external surface is ornamented with concentric striæ of growth.

Note.—I find myself obliged to create this new genus for a shell that seems to me identical with *Mæonia myiformis*, J. Dana, which does not belong to the genus in which the American Palæontologist has placed it. The true *Mæonia* are carinated, have a simple pallial impression, and two hinge teeth. The genus I have created occupies an intermediate position between *Panopæa* and *Glycimeris;* it resembles the first by its single tooth, and the second by the strong callosity of its hinge; it differs from both by its shell gaping on one side only. So far this genus is represented by the single species that I am now about to describe.

CLARKIA MYIFORMIS, *J. D. Dana.*

Pl. XVIII, Fig. 1.

Pyramus myiformis, J. D. Dana, 1847, Am. Journ. Sci. IV, p. 157.
Mæonia „ *Idem*, 1849, Geol. Wilkes' U.S. Explor. Exped., p. 697, pl. 6, fig. 4.

This is an elongated, elliptical shell, with very small, slightly recurved beaks, very close together, and placed at the anterior third of the shell. Its internal surface is perfectly smooth. A slight callosity originating at the beak extends to the middle of the breadth of each valve. The valves are moderately deep, and rather depressed towards their anterior side, which is a little broader than the posterior side. I have seen only a small part of the external surface of the valves; it is ornamented with numerous, fine, concentric lines of growth. The test is rather solid, from one to two millemetres thick.

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[1] I dedicate this genus to the Rev. W. B. Clarke, to whom I am indebted for the collection of fossils furnishing the subject of this work.

Dimensions.—The length is seven and a half, the breadth four and a half, the thickness three, and the distance between the beaks and the anterior margin three centimetres.

Relations and Differences.—The internal structure, especially the muscular impression, resembles that of some species of *Sanguinolites;* but they are easily distinguished by the fact that as the tests of the *Sanguinolites* are very thin, all the external ornamentation is reproduced on the internal casts, which is not the case with *Clarkia.*

Horizon and Localities.—The two specimens which have served me for this description, and which fortunately represent the two valves, come from a greyish sandstone at Wollongong, in which Mr. J. Dana also found the specimen he has figured.

Genus—CARDIOMORPHA, *L. G. de Koninck.*

CARDIOMORPHA GRYPHOIDES, *L. G. de Koninck.*

Pl. XVIII, Fig. 4.

This shell is tumid and globose, and remarkable for the form and size of its beaks, each beak being so strongly recurved as to meet itself. I unfortunately know only the anterior half of the shell, and its internal cast; this fragment has, however, enabled me to discover the characteristics of the genus, and to assure me that it differs from those of its congeners already described. The internal cast has preserved the impressions of the anterior adductor muscles; they are perfectly circular and very shallow.

Dimensions.—The breadth is 7·5, the thickness six centimetres, and the length unknown.

Horizon and Localities.—This fragment was found in a brownish sandstone near Stony Creek.

CARDIOMORPHA ? STRIATELLA, *L. G. de Koninck.*

Pl. XX, Fig. 3.

This is a small, oval, regularly ventricose shell, about one-third longer than broad. Its beaks are very small, slightly recurved, and placed nearly in the middle of the hinge line. The whole surface is ornamented with fine, concentric striæ of growth, scarcely visible to the naked eye.

Dimensions.—The length is seventeen, the breadth thirteen, and the thickness five, millimetres.

Relations and Differences.—The shape of this species connects it with my *C. Puzosiana,* from which it differs by its thinner and less distinct striæ.

Horizon and Localities.—It is found in a dark-grey limestone in the Ichthyodorulite Range on the banks of the Karua, associated with *Pleurotomaria filosa,* Sow.

Genus—EDMONDIA, *L. G. de Koninck.*

EDMONDIA ? STRIATO-COSTATA, *F. McCoy.*

Pl. XVIII, Fig. 3.

Pullastra? striato-costata, F. McCoy, 1847, Ann. Mag. Nat. Hist., XX, p. 305, pl. 14, fig. 3.

The hinge of this species could not be found, and I have placed it in the genus *Edmondia,* on account of its external resemblance to some species of that genus. It is an elongated, oval, slightly convex shell, nearly twice as long as broad. Its beaks are small, and placed very anteriorly. Its external surface is ornamented with a number of concentric wrinkles of growth, themselves covered with fine, parallel striæ, visible only with the aid of a lens.

Dimensions.—The length is ten, and the breadth six, millimetres.

Relations and Differences.—This species differs from young individuals of *E. unioniformis,* J. Phillips, by the striæ ornamenting its lines of growth; it differs from other related species by its small size and its more oval form.

Horizon and Localities.—According to McCoy this species is common in the shales of Dunvegan. I know only a single specimen, and that was found in a greyish-olive argillaceous limestone at Burragood.

EDMONDIA NOBILISSIMA, *L. G. de Koninck.*

Pl. XX, Fig. 2.

This is a large and beautiful subtrigonal shell, a little longer than broad, with rather thick beaks recurved forwards, and touching each other. The anterior margin is slightly hollowed, and prolongs itself so as to form a very decided angle at its junction with the regularly curved ventral margin. The external surface is entirely covered with concentric folds of growth, which gradually become thinner as they approach the anterior side of the valves. The test must have been extremely thin, as is proved by some traces of it which have been preserved, and by the slight difference between the ornamentation of internal casts and that of external impressions. None of the casts I have examined have preserved any trace of either the muscular impressions or of the pallial sinus; but most of them have an empty space under the beaks that may have been occupied by the oblique plates of cartilage which characterise the genus. Occasionally some slight traces of this cartilage are preserved, thus leaving little doubt about the generic determination.

Dimensions.—Some specimens reach a length of ten and a half, a breadth of eight and a half, and a thickness of about seven and a half, centimetres.

Relations and Differences.—A superficial examination of this species would easily allow one to confound it with some varieties of *Pachydomus globosus*, J. D. Sowerby, a description of which is given further on. It differs, however, not only in form, and in the regularity of its folds, but also in the thinness of its test, by the conformation of its hinge, and by the complete absence of all trace of muscular impressions on the internal casts of its valves.

Horizon and Localities.—All these specimens were found in a rather friable, greyish sandstone, between Muree and Morpeth.

EDMONDIA INTERMEDIA, *L. G. de Koninck.*

Pl. XVIII, Fig. 4.[1]

This is a rather large, moderately thick, subtrigonal shell, a little longer than broad. Its anterior margin is convex; its beaks thick and recurved, and placed towards the anterior third of the hinge line. The external surface is ornamented by regularly spaced concentric furrows, between which are numerous, and not very apparent, parallel striæ. As in the preceding species the shell was very thin, and has entirely disappeared.

Dimensions.—The length is nine and a half, the breadth seven and a half, and the thickness five and a half centimetres.

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[1] [Pl. 20, fig. 4.—W.S.D.]

Relations and Differences.—This species is closely related to the preceding; and differs from it only by its external ornamentation, and in its proportions. It might almost be considered a variety of the same species.

Horizon and Localities.—It is found in the same sandstone as *E. nobilissima.*

Genus—CARDINIA, *L. Agassiz.*

CARDINIA EXILIS, *F. McCoy.*

Pl. XVIII, Fig. 2.

Cardinia ? exilis, F. McCoy, 1847, Ann. Mag. Nat Hist., XX, p. 303, pl. 15, fig. 1.

This is an elongated, oval, depressed shell, much broader anteriorly than posteriorly, with a sharp ventral margin. The hinge line is as much arched as the ventral margin, to which it is united by an elliptical curve bounding the anal or posterior margin. The anterior margin and the beaks are united by a curve rendered slightly sinuous by the lunule. The very small and nearly straight beaks, anteriorly placed, touch each other; the external ligament is rather long, occupying nearly one-third of the length of the hinge line. The shell is very solid, having a mean thickness of more than two millimetres; its surface is ornamented with numerous small, irregular, concentric lines of growth; it is black, while the rock in which it is preserved is greyish-white.

Dimensions.—The length is about eight, the breadth four, and the thickness two centimetres.

Relations and Differences.—I could not find the hinge of this species, but it has all the external characteristics of *Cardinia,* and according to McCoy the shape of their pallial and muscular impressions also, so that I think I am safe in placing it in this genus. I know no Carboniferous species sufficiently like it to be confounded with it.

Horizon and Localities.—A single specimen of this species was found at Wollongong.

Genus—PACHYDOMUS, *J. Morris.*

PACHYDOMUS GLOBOSUS, *J. D. Sowerby.*[1]

Pl. XVIII, Fig. 5.

Megadesmus globosus,	J. D. Sowerby, 1838, in Mitchell's Three Exped. Interior E. Australia, I, p. 15, pl. 1, fig. 1, 2.
Pachydomus, „	J. Morris, in Strzelecki's Phys. Descr. of N. S. Wales and V. D. Land, p. 272, pl. 10, fig. 2, 3.
„ „	F. McCoy, 1847, Ann. Mag. Nat. Hist., XX, p. 301.

The shell is oval, ventricose, and a little longer than broad. Its valves are deep and regularly ventricose, and its beaks thick and recurving so as to touch each other. The external ligament is very strongly developed. The surface ornamentation consists of numerous concentric furrows of growth, irregular both in form and in distribution; sometimes they are very deep and broad, and sometimes narrow and superficial. The shell is so thick as to leave no trace of the external ornamentation on the internal cast of the shell.

Dimensions.—This species can acquire very large dimensions. I have figured the only nearly perfect specimen sent me; it is eight centimetres long, six and a half broad, and five and a half thick; the test has an average thickness of two millimetres.

Relations and Differences.—This species, in its general form, is very similar to *E. nobilissima,* which differs from it by the much less anterior position of its beaks, by a much greater regularity of the concentric folds of its surface, and above all by the thinness of its test, which is so thin as to allow the internal casts to reproduce and preserve the surface ornamentation.

Horizon and Localities.—This species was found at Wollongong (F. McCoy) and Illawarra, N. S. Wales; at Spring Hill in Tasmania by J. Morris; and at Lochinvar (N.S.W.) by Mr. W. B. Clarke.

PACHYDOMUS LÆVIS, *J. D. Sowerby.*

Pl. XX, Fig. 1.

Megadesmus lævis,	J. D. Sowerby, 1838, in Mitchell's Three Exped. Interior E. Australia, I, p. 15, pl. 3, fig. 1.

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[1] [*Vide* R. Etheridge, Junr., Geol. and Pal. Q'land., 1892, p. 282; Stoliczka, Cret. Fauna S. India (Pal. Indica), 1871, pp. 83, 274.—W.S.D

Pachydomus, lævis, J. Morris, 1855, in Strzelecki's Phys. Descr. N. S. Wales and V. D. Land, p. 272.
,, ,, J. D. Dana, 1849, Geol. Wilkes' U.S. Explor. Exped., p. 694.

This is a large, elongated, oval shell, with relatively shallow valves, and moderately thick, slightly recurved, submedial beaks. The anterior margin is rather regularly rounded, while the posterior is slightly angular and depressed. The external surface is ornamented with some irregular, concentric undulations, especially towards the ventral margin; the entire surface is also covered with fine striæ of growth. Although the shell is extremely thin there is no trace of the external ornamentation on the interior of the valves which is perfectly smooth.

Dimensions.—The length is about ten, the breadth seven, and the thickness six centimetres.

Relations and Differences.—This species is easily distinguished from the preceding by its much less globose form, its small relative thickness, and above all by the thinness of its test.

Horizon and Localities.—This was found at Illawarra by Mr. J. Morris, and at Harper's Hill by Mr. J. D. Dana; and in a greyish, rather compact limestone at Lochinvar, associated with *P. globosus.*

PACHYDOMUS GIGAS, *F. McCoy.*

Pachydomus gigas, F. McCoy, 1847, Ann. Mag. Nat. Hist., XX, p. 301, pl. 16, fig. 3.

This shell is rather large, elongated, and oval, very nearly one-third as long as broad, with moderately deep valves. The beaks are thick and recurved, and placed towards the anterior third of the shell. The posterior margin is slightly truncated, with rounded angles; the anterior margin is rounded, rather short, and united to the ventral margin by a slight concave sinuosity. The whole surface is ornamented with slight undulations and concentric striæ of growth. The test appears to have been very thin; but it must have been smooth inside as no traces of the external ornamentation have been preserved on the internal casts of the valves.

Dimensions.—The length is fourteen, and the breadth nine centimetres.

The only specimen of this species sent me was found in too bad a state of preservation to allow of me taking the the exact dimensions, or to give all the characteristics. I must, therefore, content myself with giving the figure and description published by Mr. F. McCoy.

Relations and Differences.—This species is easily distinguished from the preceding, the only one it appears to resemble, by its more elongated and more depressed form, and also by the more decided truncation of its posterior margin, and the sinuosity of its ventral margin.

Horizon and Localities.—Professor McCoy says it is common in the fine-grained sandstone of Wollongong. The only specimen I have received is very badly preserved, and was found in a greyish sandstone at Mt. Vincent.

PACHYDOMUS OVALIS, *F. McCoy.*

Pl. XIX, Fig. 3.

Pachydomus ovalis, F. McCoy, 1847, Ann. Mag. Nat. Hist., XX, p. 302, pl. 14, fig. 4.

This is a rather oblong and oval shell, with moderately deep valves, and rather thick anterior beaks. The posterior edge is slightly angular; the anterior rounded, forming a curve of short radius to unite it with the hinge line; the ventral edge is rather regularly arched. The surface is ornamented with strong concentric, unequal wrinkles of growth; the lunule is oval and deep; and the external ligament rather well developed. The interior of the valves is almost perfectly smooth. The anterior and posterior impressions of the adductor muscles are large and oval; that of the retractor of the foot is narrow and semilunar, surrounding the posterior half of the impression of the anterior adductor muscle. According to Mr. McCoy the pallial impression is slightly sinuous towards that part which touches the posterior muscular impression; but I could not determine this.

Dimensions.—The length is fifty-five, the breadth forty-five, and the thickness about twenty millimetres.

Relations and Differences.—This differs from *P. globosus* by its surface ornamentations, and by its lesser thickness; it differs from *P. cyprina,* and *P. intrepidus,* J. D. Dana, by its much greater relative breadth, and by the form of its external concentric folds.

Horizon and Localities.—According to McCoy it is very abundant in the Wollongong sandstone.

PACHYDOMUS CYPRINA, *J. D. Dana*.[1]

Pl. XVIII, Fig. 6.

Astartila cyprina, J. D. Dana, 1847, Am. Journ. Sci., IV (2), p. 155.

„ „ Idem, 1849, Geol. Wilkes' U.S. Explor. Exped., p. 680, pl. 3, fig. 6 and 7?

This shell is of moderate size, oval, thick, and very nearly one-third longer than broad. Its beaks are thick, recurved, placed anteriorly, and very wide apart. The external surface is ornamented with closely crowded concentric striæ; the internal surface is smooth except for some slight, irregular, transverse rugosities, and some indistinct folds beyond the pallial impression. The pallial impression is simple, and not far from the ventral margin. The muscular impressions are rather deep; that of the anterior adductor is subquadrangular, while the posterior is oval; both are superficially striated; the impression of the retractor of the foot is sigmoidal and smooth.

Dimensions.—The length is forty-three, the breadth thirty-three, and the thickness thirty-one, millimetres.

Relations and Differences.—By its size and general form this species resembles the preceding; it differs from it by its measurements and by its muscular impressions.

Horizon and Localities.—It is found with the preceding.

PACHYDOMUS PUSILLUS, *F. McCoy*.

Pl. XIX, Fig. 2.

Pachydomus? pusillus, McCoy, 1847, Ann. Mag. Nat. Hist., XX, p. 302, pl. 16, fig. 1, 2.

This is a small, suborbicular or globose shell, nearly as long as broad, with an arched hinge-line, and small, anterior, widely separated beaks. The anterior side is short and rounded; the external ligament well developed; the anterior muscular impression oval and deep, the posterior oval and superficial; the pallial impression is entire; and, according to Mr. McCoy, the test is thick, and its surface covered with rugose, imbricated, concentric wrinkles.

Dimensions.—The length is seventeen, breadth sixteen, and thickness fourteen, millimetres.[2]

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[1] [Dana's genus *Astartila*, classed here under *Pachydomus*, would appear to be valid. Stoliczka, Cret. Fauna S. India (Pal. Indica), 1871, pp. 274, 275; R. Etheridge, Junr., Geol. and Pal. Q'land, 1892, p. 277.—W.S.D.]

[2] I may state that these measurements were taken from a very perfect internal cast.

Relations and Differences.—By its small size and great thickness this species differs from all its congeners.

Horizon and Localities.—According to McCoy it is common in the Wollongong sandstone.

PACHYDOMUS POLITUS, *J. D. Dana.*

Pl. XIX, Fig. 4.

Astartila polita, J. D. Dana, 1849, Am. Journ. Sci., IV (2), p. 155.
„ „ Idem, 1849, Geol. Wilkes' U.S. Explor. Exped., p. 690, pl. 4, fig. 2.

This is a moderate-sized, oval shell, rather longer than broad, with slightly recurved beaks, placed in the front quarter of the shell. Its anterior and ventral margins form only one regular curve, while the posterior is slightly truncated. The exterior surface is smooth and glossy, and shows some concentric lines of growth. The shell is very thin; the muscular impressions are not distinct; the anterior impression is rather large, and oval, and striated transversely; the posterior impression is so faintly marked as to be almost imperceptible.

Dimensions.—The length is thirty-nine, breadth thirty-one, and thickness twenty-two, millimetres.

Relations and Differences.—In form this species is somewhat like *P. ovalis,* McCoy, from which it differs, not only in its proportionate dimensions, but by the thinness of its test, and the gloss of its external surface.

Horizon and Localities.—Mr. J. D. Dana found this species at Black Head, Illawarra, and Mr. W. B. Clarke at Wollongong.

PACHYDOMUS DANAI, *L. G. de Koninck.*

Pl. XIX, Fig. 5.

This is a medium sized, oval or slightly cuneiform, gibbous shell, as long as broad, with small anterior beaks, approaching close to each other. The hinge-line is arched; the external ligament must have been long; there is no lunule. The external surface is covered with a series of flat concentric folds, not imbricated, and separated from each other by narrow, well-marked, furrows; the surface of these folds is ornamented with fine parallel striæ. Unlike what is usually the case, these folds are broadest nearest the beaks. The test is relatively thick, and generally transformed into a limestone spar. I do not know its internal structure.

Dimensions.—The length is twenty-four, breadth twenty-four, and thickness fifteen, millimetres.

Relations and Differences.—Of all the species of *Pachydomus* known to me, there is only *P. intrepidus* (*Astartila intrepida*) Dana, of which the surface folds bear any resemblance to those of the shell in question. But this species is larger, more elongated and relatively thinner; its test also appears to be thinner. I dedicate this pretty species to the learned naturalist who was one of the first to describe a large number of the Palæozoic fossils of Australia.

Horizon and Localities.—The species, as yet, has only been found in a greyish sandstone at Wollongong.

Genus—MÆONIA, *J. D. Dana.*[1]

MÆONIA KONINCKI, *W. B. Clarke.*

Pl. XIX, Fig. 6.

This is a large, very tumid and elongated, very inequilateral, suboval shell, a little truncated posteriorly. The valves are gibbous, the hinge-line very long and arched; the anterior margin is short and joined to the inferior margin by a curve of small radius; the ventral margin is slightly curved, longer than the hinge-line, and slightly sinuous in adult individuals; the posterior margin is rather regularly curved, and joined to the adjacent margins without any decided boundary between. The beaks are thick, very obtuse and placed very anteriorly. Under the beaks the margins are strongly depressed so as to form a deep pit that could not be mistaken for a lunule as it has no appreciable limit. The test has a mean thickness of three millimetres, except on the edges, which are sharp, and towards the beak where it is a little thicker. The surface is very nearly smooth, the ornamentation consisting only of irregularly-distributed, fine, concentric, rings of growth; the presence of which enabled me to restore and determine the only specimen sent me, which was much broken.

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[1] [For a discussion of the generic value of *Mæonia*, *Pachydomus*, *Notomya*, see Stoliczka, Cret. Fauna S. India (Pal. Indica), 1871, p. 83; R. Etheridge, Junr., Cat. Austr. Foss., 1878, pp. 71, 72; Geol. and Pal. Q'land., 1892, pp. 282, 283.—W.S.D.]

Dimensions.—The length is ten, breadth 11·5, and thickness eight, centimetres.

Relations and Differences.—In size this species resembles ***Mæonia grandis***, J. D. Dana, it differs from it essentially by the sinuosity of its ventral margin, and by its much more anterior and more tumid beaks.

Horizon and Localities.—I have no exact information with regard to the horizon of this species, but I believe I am right in considering it Carboniferous. Mr. W. B. Clarke found it in a grey limestone at Coolalamine. He wished me to dedicate it to myself.

MÆONIA ELONGATA, *J. D. Dana.*

Plate XX, Fig. 6.

Myonia elongata, J. D. Dana, 1847, Am. Journ. Sci., IV (2), p. 158.
Mæonia ,, Idem, 1849, Geol. Wilkes' U.S. Explor. Exped., p. 695, pl. 5, fig. 3.

This is a large, thick, elongated shell, nearly twice as long as broad, and a little compressed and angular posteriorly. According to J. D. Dana the right valve is slightly thicker than the other. The beaks are tumid, recurved, and placed in the anterior fourth of the valves. An oblique depression originating at the beaks reaches to the posterior third of the ventral margin, and there causes a well-marked sinuosity, at the same time producing a decided inflation which following the same oblique direction, ends in the junction of the anal and ventral margins. The posterior side is obliquely truncated. The external surface is covered with numerous, concentric, unequal, well-marked wrinkles. The muscular impressions are large and transversely striated.

Dimensions.—The length is fourteen, breadth seven, thickness six and a half, centimetres.

Relations and Differences.—This large and beautiful ***Mæonia*** cannot be confounded with any other species; I know of none with which it could be compared; it is a kind of transition form between ***Pleurophorus*** and ***Mæonia.***

Horizon and Localities.—Mr. J. D. Dana found it at Black Head, in the Illawarra District, and Mr. W. B. Clarke at Wollongong in a red sandstone.

MÆONIA GRACILIS, *J. D. Dana.*[1]

Pl. XIX, Fig. 1.

Cleobis gracilis, J. D. Dana, 1847, Am. Journ. Sci., IV (2), p. 154.
Mæonia, „ Idem, 1849, Geol. Wilkes' U.S. Explor. Exped., p. 698, pl. 7, fig. 1.

This shell is of moderate size, elongated, oval, and a little angular posteriorly. Its beaks are thick and anterior, its ventral margin regularly curved, its anterior margin rounded, and its posterior margin slightly arched and obliquely truncated. The external surface is not keeled, and is covered with indistinct, irregular, concentric wrinkles. The internal structure of the valves is unknown to me.

Dimensions.—The length is eight, breadth is five and a half, and thickness about four centimetres.

Relations and Differences.—This species is distinguished from *M. grandis* by the angular form of its posterior margin, and the greater irregularity of its superficial concentric folds.

Horizon and Localities.—Dana found this at Wollongong, and Clarke in the Muree Quarries.

Genus—PLEUROPHORUS, *W. King.*

PLEUROPHORUS MORRISII, *L. G. de Koninck.*

Pl. XX, Fig. 5.

Orthonota ? costata, J. Morris, 1845, In Strzelecki's Phys. Descr. N. S. Wales and V. D. Land, p. 273, pl. 11, fig. 1, 2 (non *Pleurophorus costatus,* Brown).

This is a very inequilateral, elongated shell, with the hinge line and ventral margin sub-parallel, the anterior margin rounded, and the posterior margin slightly and obliquely truncated. Its beaks are small, straight, and very anterior. The external ligament is much elongated, its lunule narrow and sub-cordiform. The external ornamentation is remarkable; the anterior part, forming nearly one-third of the total surface, is covered with small wrinkles, parallel to the ventral margin; while the posterior part is crossed obliquely by from twelve to fifteen radiating ribs, the central one coming from the beak; these ribs, perfectly distinct from each other and very much alike, are crossed by minute, scarcely perceptible striæ. According to Mr. Morris the muscular impressions are rather strong, and are united by a simple pallial impression. I was obliged to change the name given it by this learned geologist, because Brown had already made use of it for an entirely different species; but I have taken the opportunity to dedicate it to him.

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[1] [R. Etheridge, Junr., Journ. R. Soc. N. S. Wales, 1880 [1881], XIV, p. 251. Waagen, Salt Range Fossils (Pal. Indica), 1891, IV, Pt. 2, p. 143, t. 8, f. 5.—W.S.D.]

Dimensions.—The length is eight, and the breadth one and a half centimetres. I have taken these measurements from the figures published by Mr. Morris.

Relations and Differences.—According to Morris this species bears some resemblance to *Cypricardites corrugata*, Conrad.

Horizon and Localities.—It was found in the Illawarra District by Strzelecki, and in a greyish sandstone at Wollongong by the Rev. W. B. Clarke.

PLEUROPHORUS BIPLEX, *L. G. de Koninck.*

Pl. XIX, Fig. 1.[1]

This is a moderate sized, elongated, elliptical, rather thick shell, having its hinge line and ventral margin sub-parallel, its anterior and posterior sides rounded, and its beaks very anterior and thick. Judging from the traces preserved on the only internal cast sent me the external ornaments were concentric striæ, and two oblique ribs starting from the beak and dividing the surface into two, nearly equal, sub-triangular parts. This arrangement leaves no doubt as to its generic determination. The impressions of the anterior adductor muscles are small, sub-triangular, and longitudinally wrinkled. I could not find the posterior muscular impression.

Dimensions.—The length is forty-five, the breadth twenty-one, and the thickness seventeen millimetres.

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[1] [Pl. XIX, fig. 7.—W.S.D.]

Relations and Differences.—It is not easy to make a comparison between this species, of which only an internal cast and a few traces of the shell are known, and other species of the same genus. Yet I think it resembles *P. tricostatus*, Portlock, which has the same shape, but three instead of two keels.

Horizon and Localities.—This was found in the Wollongong sandstone.

PLEUROPHORUS CARINATUS ?, *J. Morris*.[1]

Pl. XIX, Fig 8.

Pachydomus carinatus, J. Morris, 1845, In Strzelecki's Phys. Descr. N. S. Wales and V. D. Land, p. 273, pl. 11, fig. 3.

„ „ F. McCoy, 1847, Ann. Mag. Nat. His., XX, p. 301.

Cypricardia rugulosa, J. D. Dana, 1847, Am. Jour. Sci., IV (2), p, 157.

Mæonia ? carinata, *Idem*, 1849, Geol. Wilkes' U. S. Explor. Exped., p. 696, pl. 6, fig. 1.

This shell is elongated and subcuneiform, with slightly recurved beaks placed towards the anterior third of the total length. An oblique keel starting from the beaks, strikes out towards the posterior extremity of the the ventral margin, and divides the surface into two very unequal parts. Having only an internal cast, and not being able therefore to say positively that it belongs to this species, I will not go into further detail, but simply refer to Pl. XIX, Fig. 8.

Horizon and Localities.—Mr. McCoy says that *P. carinatus* is very abundant at Wollongong, where the internal cast in question was found. Mr. Morris says they occur at Illawarra.

Genus—CONOCARDIUM, *H. Bronn.*

CONOCARDIUM AUSTRALE ?, *F. McCoy.*

Pleurorynchus australis, F. McCoy, 1847, Ann. Mag. Nat. Hist., XX, p. 300, pl. 16, fig. 4.

Cardium australe, J. D. Dana, 1849, Geol. Wilkes' U. S. Explor. Exped., p. 701, pl. 8, fig. 2.

This is a subtrigonal, gibbous, externally carinated shell. Its anterior side is truncated, depressed, and slightly convex. Its anterior surface is cordiform, and clearly separated into three nearly equal parts by two arched furrows originating at the beaks; the rest of the same surface is ornamented with small folds, equal to each other, and parallel with the keel which serves to limit them. The posterior part terminates in a slightly truncated angle; it gapes and its ventral margin is slightly sinuous. The surface of the valves is ornamented with irregular radiating ribs separated by narrow furrows.

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[1] [*Mæonia carinatus*, R. Etheridge, Junr., Geol. and Pal., Q'land., 1892, p. 283. *Pachydomus carinatus*, A. H. Foord, Geol. Mag., 1890, VII (3), p. 154.—W.S.D.]

Dimensions.—The specimens figured by McCoy and Dana are about two and a half centimetres long by one and a half broad.

Relations and Differences.—This species differs from *C. aliformis*, Sowerby, by the keel limiting its anterior surface and by the division of its surface into three distinct parts; its ribs are also thinner and more numerous.

Horizon and Localities.—I cannot confidently assert that this small specimen of *Conocardium* really belongs to the species defined by McCoy and Dana in which I have placed it. This specimen was found in a railway cutting between Maitland and Stony Creek. Dana found this species at Glendon.

Genus—TELLINOMYA, *J. Hall.*

TELLINOMYA DARWINI, *L. G. de Koninck.*[1]

Pl. XVI, Fig. 9.

This shell is rather large for the genus to which it belongs. It is pyriform, gibbous, and one-third longer than broad. Its anterior side is rounded and sub-semielliptical, its posterior side rather elongated and pointed. The beaks are rather thick and situated on the anterior third of the valves. The posterior hinge line is concave, while the anterior is convex. Its lunule is small. The whole surface is ornamented with thin, concentric, sharp-pointed, equally thick ribs, separated by deep furrows a little broader than the ribs and rounded at the bottom. The structure of the hinge is unknown to me.

Dimensions.—The length is twenty-two, breadth fifteen, and thickness eleven millimetres.

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[1] [*Nuculana Darwini. Vide* R. Etheridge, Junr., Ann. Rept. Dept. Mines N. S. Wales for 1887 [1888], p. 168.—W.S.D.]

Relations and Differences.—By its general form and its concentric striæ, this species approaches *T.* (*Nucula*) *attenuata*, Fleming, but it differs from it widely in its proportions, its breadth and thickness being so much greater in proportion to its length.

Horizon and Localities.—A single specimen of this pretty species was found in a greyish sandstone, in a railway cutting between Maitland and Stony Creek.

Genus—PALÆARCA, *J. Hall.*[1]

PALÆARCA COSTELLATA, *F. McCoy.*[2]

Pl. XVI, Fig. 6 and 7.

Byssoarca costellata, F. McCoy, 1844, Synop. Carb. Foss. Ireland, p. 72, pl. 11, fig. 36.
Arca Lacordairiana, A. d'Orbigny, 1850, Prod. Pal., I, p. 134 (non L. G. de Koninck).
„ ***costellata***, J. Morris, 1854, Cat. Brit. Foss., p. 145.

A rather small, elongated, subrhomboidal shell, with extremely convex valves, and very nearly twice as long as wide. The beaks are proportionately thick, and placed on the anterior third of the shell. The anterior side is short and rounded, the posterior truncated, and nearly rectangular, and the ventral margin subparallel to the hinge line. The two hinge teeth are posterior, elongated, and oblique to the hinge line. The surface is divided into two parts by an oblique keel beginning at the beak, and abutting on the angles formed by the intersection of the ventral and posterior margins. It is entirely covered by small radiating ribs of nearly equal thickness, crossed by concentric lines of growth of which the interior of the valve preserves no trace.

Dimensions.—The length is eleven, breadth six, and thickness three millimetres.

Relations and Differences.—This species is closely allied to *P. Lacordairiana*, de Koninck, with which Orbigny has confounded it; it differs from it by its small size, by the less sinuosity of its ventral margin, and the greater regularity of its ornamentation.

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[1] [The species—*interrupta* and *subarguta*, De Kon.—are referred by Mr. R. Etheridge, Junr., to *Arca*. Cat. Austr. Foss., 1878. p. 62.—W.S.D.]

[2] [*Parallelodon costellata.* R. Etheridge, Junr., Geol. and Pal. Q'land., 1892, p. 274, t. 40, fol. 12, 13. Mr. Etheridge suggests the possibility of the Queensland form being a new species—*Parallelodon Konincki*, Eth. fil.—W.S.D.]

Horizon and Localities.—This is found in the Carboniferous Limestone of Enniskillen, Ireland; and in the argillaceous limestone of Burragood.

PALÆARCA INTERRUPTA, *L. G. de Koninck.*

Pl. XVI, Fig. 5.

This is a small, oval, elongated shell. Its posterior side is broader than the anterior, which is rounder, while the opposite side is truncated at right angles. The beaks are small and nearly terminal. There are two small hinge teeth in front of the beak, and a lateral one nearly parallel with the hinge line. The surface is ornamented with four or five concentric subequidistant furrows.

Dimensions.—The length is seven, breadth three, and thickness one and a half millimetres.

Relations and Differences.—In the absence of the two small hinge teeth, which are easily seen, this shell could easily be mistaken for a *Modiola*, which it strongly resembles in shape. It differs from the preceding species by its more oval contour, and especially by the small number and the regularity of its furrows.

Horizon and Localities.—It was found with the preceding.

PALÆARCA SUBARGUTA, *L. G. de Koninck.*[1]

Pl. XVI, Fig. 8.

This is a small, elongated, suboval shell, tumid in the middle, and obliquely truncated posteriorly. A square gibbosity crosses it obliquely, and gives rise at the hinge line to a triangular depression. The beaks are small, recurved forwards, and situated in the anterior fourth of the hinge line. The hinge is composed of two small oblique teeth placed in front of the beaks, and of two or three teeth posterior and subparallel to the hinge line. The surface is ornamented with numerous concentric striæ at regular distances from each other.

Dimensions.—The length is twenty, breadth nine and a half, and thickness eleven to twelve millimetres.

Relations and Differences.—This species cannot be confounded with *P. costellata*, because it has no radiating folds.

Horizon and Localities.—It was found at Burragood.

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[1] [*Parallelodon subarguta*, R. Etheridge, Junr., Procs. Linn. Soc. N. S. Wales, 1889, IV (2), p. 205.—W.S.D.]

Genus—MYTILUS, *Linnæus.*

MYTILUS CRASSIVENTER, *L. G. de Koninck.*[1]

Pl. XXI, Fig. 2.

This is an elongated, cuneiform, thick shell, very ventricose on the ventral side, where the two valves approach each other abruptly, and fall nearly vertically on their ventral margin, producing a nearly plain surface; from the hinge line, on the contrary, they spread out at a gentle slope, and unite at a very acute angle. The posterior margin is rounded. The beaks are small and terminal. The impressions of the adductor muscles are oval, large, and very superficial, and placed at the posterior third of the shell. The surface must have been slightly and irregularly undulating. The shell appears to have been very thin.

Dimensions.—The length is seven, the breadth three and a half, the thickness three centimetres.

Relations and Differences.—In general form and in size this species resembles *M. mosensis*, Ryckholt; it differs by its much greater relative thickness, by its less curved hinge line, and by its surface ornamentation.

Horizon and Localities.—A single cast of this species was found in a brownish sandstone at Branxton.

MYTILUS BIGSBYI, *L. G. de Koninck.*[2]

Pl. XXI, Fig. 1.

This shell is elongated, slightly arched, one-third longer than broad, and almost regularly ventricose. Its posterior side is rounded and very long, the ventral margin but little curved, and the beaks rather thick and terminal. The surface is covered with from twelve to fifteen strong, concentric, rather unequal undulations. The impressions of the adductors are very large, well marked, nearly circular, and placed towards the middle of the length of the valves. The shell, which seems to have been rather thick, is utterly unknown to me.

Dimensions.—The length is six and a half centimetres, the breadth forty-seven millimetres, and the thickness thirty millimetres.

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[1] [2] [*Mytilops* (?). R. Etheridge, Junr., Geol. and Pal. Q'land., 1892, p. 272, t. 14, f. 20.—W.S.D.

Relations and Differences.—This species could easily be mistaken for an *Aphanaia* without the equality of the valves, so much does it resemble it by its external ornamentation; it is allied to *M. pernella*, Ryckholt. It differs in its proportions and dimensions, and the much greater number of its external concentric folds.

Horizon and Localities.—An internal cast of ***M. Bigsbyi*** was found in a yellowish micaceous sandstone at Branxton.

Genus—AVICULOPECTEN, *F. McCoy.*

AVICULOPECTEN LENIUSCULUS, *J. Dana.*

Pl. XXI, Fig. 3.

Pecten leniusculus, J. D. Dana, 1849, Geol. Wilkes' U.S. Explor. Exped., p. 704, pl. 9, fig. 6.

This is a large, plano-convex, orbicular shell. A large part of its surface is nearly smooth. The surface ornamentation consists of thin, radiating ribs, rather irregular towards the margins; the ribs of the right valve are a little thicker than those of the left. The beak of the right valve is submedian and straight. The ears are large, subequal, striated longitudinally and waved transversely.

Dimensions.—The length and breadth are thirteen, and the thickness about two centimetres.

Relations and Differences.—This species is remarkable for its large size, and seems to bear some resemblance to ***A. concavus***, McCoy, from which it differs by having no radiating folds on a large part of its surface, and by its more transverse form.

Horizon and Localities.—It was found in the Illawarra District by Mr. J. D. Dana, and in a calcareous conglomerate at Mt. Gimbela by Mr. W. B. Clarke.

AVICULOPECTEN SUBQUINQUELINEATA, *F. McCoy.*[1]

Pl. XXII, Fig. 2.

Pecten sub-5-lineatus, McCoy, 1847, Ann. Mag. Nat. Hist., XX, p. 298, pl. 17, fig. 1.

This shell is large, broader than long, transversely suboval, and inequivalved. The right valve is more convex than the left valve, which, however, is not entirely flat; the result of this formation is that the beak of the right valve is thicker than the other. The beaks are placed near the middle of the hinge line. The ears are large, subequal, and flat; the anterior ear is better defined than the posterior, and is separated from the rest of the shell by a rather deep curved sinus. Its surface is ornamented with about twenty-five principal, rather thick, radiating folds having their origin at the beaks; between these and at some distance from the beaks interpose other and thinner folds, which, in turn, increase before reaching the margins. It must be noted that this arrangement is not absolutely regular, that the principal folds are not always the same distance apart, and that the number of interposed folds is very variable. All these folds are crossed by concentric waves of growth.

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[1] [R. Etheridge, Junr., Proc. R. Phys. Soc. Edinb., 1880, V, p. 297, t. 15, f. 52; Geol. and Pal. Q'land., 1892, p. 266.—W.S.D.]

Dimensions.—The length is nine, breadth seven and a half, and thickness one and a half centimetres.

Relations and Differences.—According to McCoy, who seems to have had the opportunity of examining the shell itself of this species while I have only had internal casts, it is somewhat like his *A. quinquelineatus* of Ireland; it differs from it by its intermediate folds being thinner and their arrangement less definite near the margins, it is also more convex.

Horizon and Localities.—It seems rare in a fine-grained sandstone at Harper's Hill (McCoy). Mr. W. B. Clarke found it in a similar sandstone at Muree.

AVICULOPECTEN LIMÆFORMIS, *J. Morris.*[1]

Pl. XXII, Fig. 4.

Pecten limæformis,	J. Morris, 1845, in Strzelecki's Phys. Descr. N.S. Wales, and V. D. Land, p. 277, pl. 18, fig. 1.
Aviculopecten ? limæformis,	R. Etheridge, 1872, Quart. Journ. Geol. Soc., XXVIII, p. 326, pl. 14, fig. 1.

This is a very large, inequivalved, inequilateral, transversely oval, and slightly oblique shell. The right or upper valve is much more convex than the lower. According to Mr. J. Morris the ears are relatively small. The surface is ornamented with thirty-five or thirty-six angular, radiating folds, simple or only rarely bifurcating, and consequently clearer at the margins than at the beaks. These folds are not very regular, especially towards their extremities, where they are divided by wider furrows than at their origin; they are crossed by some concentric undulations of growth.

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[1] [Compare Waagen, Records Geol. Survey India, 1886, XIX, p. 27, t. 1, f. 8; Salt Range Fossils (Pal. Indica), 1891, IV, Pt. 2, p. 130, t. 5, f. 8; R. Etheridge, Junr., Geol. and Pal. Q'land., 1892, p. 266, t. 14, f. 1.—W.S.D.]

Dimensions.—The length is about thirteen, breadth fifteen, and thickness four centimetres.

Relations and Differences.—This species differs from the preceding by the obliquity of its hinge line, and the simplicity of its radiating folds.

Horizon and Localities.—This species was first found by Strzelecki in the Eastern Marshes of Tasmania, and by Mr. Daintree in the Carboniferous rocks of Gympie, Queensland. Mr. W. B. Clarke found two large specimens, one in the Muree Sandstone, and the other in the Wollongong sandstone. This last I have figured.

AVICULOPECTEN CONSIMILIS, *F. McCoy.*

Pl. XXII, Fig. 6.

Pecten consimilis, F. McCoy, 1844, Synop. Carb. Foss. Ireland, p. 91, pl. 15, fig. 16.

This shell is small, oval, slightly convex, with an entirely smooth surface. Its ears are rather small and unequal, the anterior ear is the largest, rounded at its extremity, and distinctly separated from the rest of the shell by a linear sinus; its surface is strongly reticulated, while the surface of the posterior ear is nearly smooth, and its extremity rectangular.

Dimensions.—The length is fifteen, and the breadth thirteen millimetres.

Relations and Differences.—This species is easily distinguished from *A. orbiculatus*, McCoy, by its more oval form, but chiefly by the reticulated design on its anterior ear.

Horizon and Localities.—In Ireland it occurs at Bundoran. A single specimen of it was found in a brownish argillaceous limestone at Burragood.

AVICULOPECTEN DEPILIS, *F. McCoy.*[1]

Pl. XXII, Fig. 7.

Pecten depilis, F. McCoy, 1844, Synop. Carb. Foss. Ireland, p. 91, pl. 16, fig. 11.

This is a small, orbicular, subequilateral, slightly ventricose shell, either with a smooth surface, or simply ornamented with slight concentric rings of growth. The ears are striated, the anterior ear rounded and cleanly separated from the rest of the shell by a well-marked sinus; the posterior ear is small and rectangular. The length of the hinge line is less than the long diameter of the valves.

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[1] [*Aviculopecten Laurienti (?)*, R. Etheridge, Junr., Geol. and Pal. Q'land., 1892, p. 268, t. 43, f. 314.—W.S.D.]

Dimensions.—The length and breadth are both fifteen millimetres.

Relations and Differences.—It differs from the preceding by its more rounded form, and by the ornaments of its ears; and from *A. lævigatus*, De Koninck, by the shape of its ears, and by being thinner.

Horizon and Localities.—It is rather abundant in the limestone of Ireland, but rare at Burragood, N. S. Wales.

AVICULOPECTEN ELONGATUS, *F. McCoy.*

Pl. XXII, Fig. 5.

Pecten elongatus, F. McCoy, 1844, Synop. Carb. Foss. Ireland, p. 92, pl. 16, fig. 9.

This is a medium sized, transverse, oval, rather regularly ventricose, sub-equivalved shell. Its ears are small, the anterior ear well defined, and the posterior ear united to the main body of the valve by a very gentle curve. To the naked eye the surface appears smooth, but with a lens concentric rings of growth are perceptible.

Dimensions.—The length is thirty-six, breadth forty, and thickness twenty-three millimetres.

Relations and Differences.—In general form this species resembles *A. filatus*, McCoy, but it differs by having no radiating striæ. I have been able to determine the Australian specimens accurately by comparing them with specimens from Ireland.

Horizon and Localities.—In Ireland it is found at Millecent, in Australia at Wollongong.

AVICULOPECTEN PTYCHOTIS, *F. McCoy.*

Pecten ptychotis, F. McCoy, 1847, Ann. Mag. Nat. Hist., XX, p. 298, pl. 14, fig. 2.

This shell is small, oval, transverse, slightly ventricose, with a perfectly smooth surface. Its beaks are small and rather pointed. The ears are unequal, the anterior ear is rather narrow and divided from the rest of the valve by a sharp sinuosity, while the posterior ear is badly defined, and terminates in a right angle. The whole surface is pretty smooth and shows only very indistinct lines of growth; the extremity of the anterior ear is folded transversely.

Dimensions.—The length is seven, and the breadth nine millimetres.

Relations and Differences.—According to McCoy this species differs from *A. variabilis*, so common in the Carboniferous shales of Ireland, only by the transverse folds on the anterior ear. It cannot be confounded with *A. consimilis*, McCoy, because it is relatively broader, its apical angle is smaller, and its anterior ears are not reticulated.

Horizon and Localities.—According to McCoy it is common in the shales of Dunvegan. Mr. W. B. Clarke found it at Burragood and Wollongong.

AVICULOPECTEN KNOCKONNIENSIS, *F. McCoy.*

Pecten knockonniensis, F. McCoy, 1844, Synop. Carb. Foss. Ireland, p. 95, pl. 17, fig. 4.

This is a small, nearly circular, inequivalved shell, as broad as long, and slightly ventricose. The surface of the left valve only is ornamented with numerous, small, radiating, similar, simple ribs, separated by small furrows rather broader than the ribs, and crossed by nearly imperceptible lines of growth. The right valve has on its surface from twelve to fourteen radiating folds, originating at the beak, and a trifle thicker than those which spring up afterwards at some distance from the beaks; all these folds are interrupted at very short distances by concentric rings of growth, giving rise to small imbrications, thus making the surface more or less wrinkled. The ears are very unequal, the posterior ears are pointed, and the anterior ears rounded at their extremities; both show radiating ribs, crossed by lines of growth parallel with the margins.

Dimensions.—Length and breadth are both about ten millimetres.

Horizon and Localities.—It is found in the Carboniferous Limestone of Ireland, and on the banks of the Karua River, N.S. Wales.

AVICULOPECTEN HARDYI, *L. G. de Koninck.*

Pl. XXII, Fig. 9.

This is a small, suboval, slightly oblique shell, nearly as long as broad, not very convex, and with rather pointed beaks. The anterior three-quarters of its surface is covered with fine radiating ribs, alternately more or less distinct, nearly imperceptible on the posterior fourth; these ribs are all crossed by more distinct concentric wrinkles. The anterior ear is rather large, rounded at the extremity, and separated from the rest of the shell by the byssal notch; its surface is furnished with radiating striæ. The posterior ear is unknown to me.

Dimensions.—The length and breadth are about nine millimetres.

Relations and Differences.—I have dedicated this species to Mr. Hardy, who has greatly helped Mr. Clarke in his work. It bears some resemblance to *A. Jonesii,* McCoy, from which it differs by the greater number of its ribs and concentric folds.

Horizon and Localities.—A single specimen of this species was found at Burragood.

AVICULOPECTEN CINGENDUS, *F. McCoy.*

Pl. XXII, Fig. 8.

Pecten cingendus, F. McCoy, 1844, Synop. Carb. Foss. Ireland, p. 90, pl. 17, fig. 11.

This shell is small, orbicular and slightly convex. The ears are unequal, the posterior ear being very large and rectangular, while the anterior ear is rather small, narrow, and rounded at its extremity. The most striking characteristic is the twelve to fifteen concentric folds which ornament the surface, the thickness of which increases gradually with their distance from the beaks; these folds are perfectly smooth and disappear imperceptibly under the posterior ear.

Dimensions.—The length is twelve, and the breadth eleven, millimetres.

Relations and Differences.—This species is rather like *A. Sedgwickii,* McCoy, the surface of which has concentric folds, but less numerous and unlike in profile; the shell is also more convex and the ears of a different shape.

Horizon and Localities.—A single specimen of this species was found by Mr. Clarke in an argillaceous reddish limestone between the Karua River and Dungog. In Ireland it has been found at Abbey Bay.

AVICULOPECTEN GRANOSUS, *Sowerby*.

Pl. XXII, Fig. 10.

Pecten granosus,	J. de C. Sowerby, 1829, Min. Conch., VI, p. 144, pl. 574, fig. 2.
,, ,,	J. Phillips, 1836, Geol. Yorkshire, II, p. 213, pl. 6, fig. 7.
,, ,,	F. McCoy, 1844, Synop. Carb. Foss. Ireland, p. 93.
Aviculopecten granosus,	Idem, 1855, Brit. Pal. Foss., p. 486.

This is a plano-convex shell, rounded in form (if the ears be omitted) and capable of reaching a somewhat large size. The beak of the right valve is thick and recurved in front. The hinge line is longer than the antero-posterior diameter of the valves. The surface is ornamented with from twenty-five to thirty radiating, very thick, folds, covered from one extremity to the other with small imbricated lamellæ; between each pair of these folds, and at a little distance from the beak, arises a smaller, thinner, and nearly smooth fold. The surface of the flat valve is also ornamented with folds, alternately thick and thin, corresponding with those of the convex valve, but without the imbrications. The anterior ears are rounded at the extremities, and separated from the rest of the shell by the byssal notch; the posterior ears end in a tapering point, and are separated from the body of the shell by a slight depression, and their extremity is united to the posterior margin by a decided curve.

Dimensions.—These dimensions are taken from a nearly perfect Belgian specimen, the characteristics of which are identical with those of the Australian specimen:—length four, breadth three, thickness one, centimetres.

Relations and Differences.—This species is closely allied to my *A. Dumontianus*, but it differs by its less oblique form, and by its radiating folds being more crowded, numerous, and rugose.

Horizon and Localities.—*A. granosus* was found by Mr. J. de Carle Sowerby in a black limestone in Queen's County, Ireland. Mr. Dupont found it abundantly in the limestone of Waulsort, which belongs to his Bed IV of the Carboniferous Limestone. Two specimens were found by Mr. W. B. Clarke; one in a greyish-yellow limestone at Duguid's Hill, and the other in a greyish-yellow argillaceous limestone at Burragood, associated with *Brachymetopus Strzeleckii*, McCoy.

AVICULOPECTEN FORBESI, *F. McCoy.*

Pecten Forbesi, F. McCoy, 1844, Synop. Carb. Foss. Ireland, p. 95, pl. 15, fig. 20.

This shell is small, suborbicular, and slightly convex. Its surface is ornamented with thin, radiating ribs, originating at the beak and extending to the margins; between each pair of these ribs, and at some distance from the beak, arises a slightly thinner rib: these ribs are crossed by very thin, concentric, nearly equidistant wrinkles, very close together, producing a check pattern. The ears are small, the posterior ear terminates in a right angle, while the anterior ear is rounded and better defined; both are longitudinally striated.

Dimensions.—The length and breadth are both about twelve millimetres.

Relations and Differences.—This species somewhat resembles my *A. nobilis*, but differs from it by the great number of its concentric wrinkles.

Horizon and Localities.—A single badly-preserved specimen was found at Burragood, but I have been able to determine it with certainty by comparing it with numerous specimens from the Carboniferous Limestone of Little Island, Ireland, for which I am indebted to Mr. Edward Wood, of Richmond, Yorkshire.

AVICULOPECTEN TESSELLATUS, *J. Phillips.*

Pl. XXII, Fig. 11.

Avicula tessellata,	J. Phillips, 1836, Geol. Yorkshire, II, p. 211, pl. 6, fig. 6.
,, ,,	L. G. de Koninck, 1842, Descr. Anim. Foss. Terr. Carb. Belg., p. 134, pl. 6, fig. 2, 4, and 11 (bad).
Meleagrina tessellata,	F. McCoy, 1844, Synop. Carb. Foss. Ireland, p. 81.
Avicula tessellata,	Idem, 1847, Ann. Mag. Nat. Hist., XX, p. 299.

This is a small, suborbicular, inequivalved shell, nearly as long as broad. The right valve is a little more ventricose than the left. The surface is ornamented with from twelve to fifteen thin, nearly equidistant, nodose folds; the nodes are produced by the concentric lines of growth which are at variable distances from each other, becoming wider apart as they recede from the beak. By this arrangement the surface of the valve looks like lattice-work. This small shell possesses a relatively large ligamentary area, two millimetres broad and fifteen millimetres long. The beak of the right valve is pointed and scarcely projects beyond the hinge line. The anterior ears are nearly rectangular at their extremities, and are completely separated from the rest of the valves by a curved furrow, which, in the left valve, terminates in a byssal notch. The posterior ears are much more developed and depressed; they are prolonged into a sharp point the edge of which is united to the posterior edge of the shell by a very decided sinus.

Dimensions.—The length and breadth are about thirteen millimetres, and the thickness four to five millimetres.

Relations and Differences.—It differs from *A. nobilis* by the simplicity of its radiating ribs, by the smaller number of, and the greater distance between, the concentric folds.

Horizon and Localities.—It is found in Yorkshire at Settle and Bolland, in Ireland at Little Island, in Belgium at Visé, and in Australia at Burragood.

AVICULOPECTEN PROFUNDUS, *L. G. de Koninck.*

Pl. XXII, Fig. 3.

This is a large, suboval shell, a little broader than long, with a very convex right valve. Its beak is slightly curved, rather sharp, and does not project beyond the hinge line. Its posterior ear is very large, terminates in a right angle, and is united to the rest of the valve by a broad sinus; its surface appears to be smooth, and is certainly destitute of the radiating folds which cover the rest of the surface of the shell. These folds, numbering thirty or forty, are simple, subequal, slightly angular, and separated by shallow furrows grooved at the bottom; this last characteristic distinguishes the species from *A. planoradiatus*, the folds of which are flat, and the furrows linear. Unfortunately, I do not know either the left valve or the anterior ear of the species.

Dimensions.—The length is seven, the breadth about eight, centimetres, and the thickness of the right valve about two and a half centimetres.

Relations and Differences.—I know of only one species resembling this one in the number and simplicity of its radiating folds, and that is *A. flexuosus*, McCoy, which differs especially by the great depth of its right valve.

Horizon and Localities.—One specimen was found in a greyish-black sandstone at the foot of Harper's Hill, in a railway cutting.

AVICULOPECTEN FITTONI, *J. Morris.*

Pl. XXI, Fig. 4.

Pecten Fittoni, J. Morris, 1845, In Strzelecki's Phys. Descr. N. S. Wales and V. D. Land, p. 277, pl. 14, fig. 2.

This is an orbicular, convex shell, capable of reaching a very great size. Its ears are subequal, the anterior being only a little more rounded at the extremity than the posterior. The surface is ornamented with fourteen or fifteen thick radiating folds, each formed by the union of from three to five small granular folds, travelling parallel with each other towards the margins; at the bottom of the furrows, which separate the folds, and are of the same width as the folds, are found small ribs like those which served to form the whole of the large folds. These are the characteristics of the right valve, the only one which Mr. Morris and I have seen.

Dimensions.—Judging from a very poor imperfect specimen this species can acquire a length of twelve centimetres. The ordinary specimens have more modest dimensions; one of these, an internal cast, is only five centimetres long, and about as broad, its thickness being about one centimetre.

Relations and Differences.—This species differs from *A. comptus*, J. Dana, by the smaller number of its radiating folds and their relatively greater width. Instead of fourteen or fifteen folds, *A. comptus* has twenty or twenty-two.

Horizon and Localities.—Two internal casts of this species were found in a reddish sandstone, one at Musclebrook, the other between Muree and Morpeth. The specimen described by Mr. J. Morris was found at Mount Wellington, Tasmania.

Horizon and Localities.—This is found in the Carboniferous Limestone of Enniskillen, Ireland; and in the argillaceous limestone of Burragood.

PALÆARCA INTERRUPTA, *L. G. de Koninck.*

Pl. XVI, Fig. 5.

This is a small, oval, elongated shell. Its posterior side is broader than the anterior, which is rounder, while the opposite side is truncated at right angles. The beaks are small and nearly terminal. There are two small hinge teeth in front of the beak, and a lateral one nearly parallel with the hinge line. The surface is ornamented with four or five concentric subequidistant furrows.

Dimensions.—The length is seven, breadth three, and thickness one and a half millimetres.

Relations and Differences.—In the absence of the two small hinge teeth, which are easily seen, this shell could easily be mistaken for a *Modiola*, which it strongly resembles in shape. It differs from the preceding species by its more oval contour, and especially by the small number and the regularity of its furrows.

Horizon and Localities.—It was found with the preceding.

PALÆARCA SUBARGUTA, *L. G. de Koninck.*[1]

Pl. XVI, Fig. 8.

This is a small, elongated, suboval shell, tumid in the middle, and obliquely truncated posteriorly. A square gibbosity crosses it obliquely, and gives rise at the hinge line to a triangular depression. The beaks are small, recurved forwards, and situated in the anterior fourth of the hinge line. The hinge is composed of two small oblique teeth placed in front of the beaks, and of two or three teeth posterior and subparallel to the hinge line. The surface is ornamented with numerous concentric striæ at regular distances from each other.

Dimensions.—The length is twenty, breadth nine and a half, and thickness eleven to twelve millimetres.

Relations and Differences.—This species cannot be confounded with *P. costellata*, because it has no radiating folds.

Horizon and Localities.—It was found at Burragood.

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[1] [*Parallelodon? subarguta*, R. Etheridge, Junr., Procs. Linn. Soc. N. S. Wales, 1889, IV (2), p. 205.—W.S.D.]

Genus—MYTILUS, *Linnæus.*

Mytilus crassiventer, *L. G. de Koninck.*[1]

Pl. XXI, Fig. 2.

This is an elongated, cuneiform, thick shell, very ventricose on the ventral side, where the two valves approach each other abruptly, and fall nearly vertically on their ventral margin, producing a nearly plain surface; from the hinge line, on the contrary, they spread out at a gentle slope, and unite at a very acute angle. The posterior margin is rounded. The beaks are small and terminal. The impressions of the adductor muscles are oval, large, and very superficial, and placed at the posterior third of the shell. The surface must have been slightly and irregularly undulating. The shell appears to have been very thin.

Dimensions.—The length is seven, the breadth three and a half, the thickness three centimetres.

Relations and Differences.—In general form and in size this species resembles *M. mosensis*, Ryckholt; it differs by its much greater relative thickness, by its less curved hinge line, and by its surface ornamentation.

Horizon and Localities.—A single cast of this species was found in a brownish sandstone at Branxton.

Mytilus bigsbyi, *L. G. de Koninck.*[2]

Pl. XXI, Fig. 1.

This shell is elongated, slightly arched, one-third longer than broad, and almost regularly ventricose. Its posterior side is rounded and very long, the ventral margin but little curved, and the beaks rather thick and terminal. The surface is covered with from twelve to fifteen strong, concentric, rather unequal undulations. The impressions of the adductors are very large, well marked, nearly circular, and placed towards the middle of the length of the valves. The shell, which seems to have been rather thick, is utterly unknown to me.

Dimensions.—The length is six and a half centimetres, the breadth forty-seven millimetres, and the thickness thirty millimetres.

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[1] [2] [*Mytilops* (?). R. Etheridge, Junr., Geol. and Pal. Q'land., 1892, p. 272, t. 14, f. 20.—W.S.D.

the hinge line. Of the two first, which are placed near the middle of the valves and not far from the posterior margin, one is much larger than the other, the first is nearly circular, while the second, which is double its size, is sub-semilunar and curves round a part of the first (Pl. XXI, Fig. 5*a*). The small impression of the muscle of the foot appears to be double, and more deeply hollowed in the valve than the preceding.

Dimensions.—These are very variable; those given here are taken from a specimen with one perfectly-preserved valve:—length six, breadth seven, thickness about three, length of hinge line three and a half centimetres.

Horizon and Localities.—According to McCoy this species is abundant in the sandstone at Glendon and Wollongong. Mr. Clarke found it in the sandstone at Müree and Branxton.

APHANAIA GIGANTEA, *L. G. de Koninck.*

Pl. XXI, Fig. 6.

This is a very large, transversely oblique, oval, pointed shell. Its right valve is very much thicker, and a little larger than the left; the former is recurved on itself by the turning up of the ventral margin. The beaks are thick, nearly straight, pointed and terminal. The hinge line is straight and very oblique with reference to the direction of the beaks. The surface exhibits very large, irregular, concentric undulations. Judging from some traces of it the test was very thin, the hinge alone is formed of a pretty thick, rounded callosity. The impressions of the adductor muscles are enormous, and are placed between the posterior and ventral sides of the shell not far from the margins; one is oval, and only half the size of the other, although its greatest diameter may be three centimetres; it projects a little into the second which, except for the hollow produced by the first, would also be oval and have a diameter of five and a half centimetres. The impression of the muscle of the foot is minute, scarcely perceptible, and placed near the middle of, at a short distance from, the hinge line.

Dimensions.—The breadth is twelve centimetres; the diameter from the beaks to the ventral margin twenty-seven centimetres; the length of the hinge line nine centimetres; the thickness near the beaks seven centimetres, and three centimetres at a distance of six centimetres from the ventral margin.

Relations and Differences.—This cannot be confounded with the preceding species, nor with any of its congeners, on account of its size, the boat-like curve of its larger valve, and the great obliquity of its hinge line.

Horizon and Localities.—A single specimen of this large and beautiful species was found in a brown micaceous sandstone at Branxton.

Genus—PTERINEA, *A. Goldfuss.*

PTERINEA MACROPTERA, *J. Morris.*[1]

Pl. XVI, Fig. 12.

Pterinea macroptera,	J. Morris, 1845, In Strzelecki's Phys. Descr. N. S. Wales and V. D. Land, p. 726, pl. 13, fig. 2, 3.
,, ,,	F. McCoy, 1847, Ann. Mag. Nat. Hist., XX, p. 299.
,, ,,	J. D. Dana, 1849, Geol. Wilkes' U. S. Explor. Exped., p. 704.

This is a moderate-sized, very oblique, inequivalved shell, rounded and largely-winged posteriorly. Its ventral margin is curved and sinuous towards its anterior part; its beaks are rather thick, and very anterior, and in front of each beak is a prominent, rather long tooth nearly perpendicular to the hinge line. The hinge line is a little shorter than the shell itself, and posteriorly there is a very thin, long tooth, nearly parallel with the hinge line as in the *Avicula.* The right valve is rather smaller and more sinuous than the left. The anterior ear is short, and seems to have been pointed, if one may judge from the figure of it given by Mr. Morris. Probably the surface was nearly smooth, marked only with irregular rings of growth. I know only the internal cast of this species, unless, as I imagine, *Cypricardia acutifrons,* J. D. Dana, is identical with it.

Dimensions.—The length of the hinge line is about 2·7 [2] centimetres, the mean breadth of the shell three and a half centimetres, and its greatest thickness close to the beaks from four to five millimetres.

Relations and Differences.—This species differs from its congeners by the slight development of its hinge line, and the absence of surface ornamentation.

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[1] [This species has been made the type of a genus—*Merismopteria.* R. Etheridge, Junr., Geol. and Pal. Q'land., 1892, p. 271; Procs. Linn. Soc. N. S. Wales, 1889, IV (2), p. 204.—W.S.D.]

[2] [The text gives 27 centimetres as the length of the hinge line, obviously a misprint.—T.W.E.D.]

Horizon and Localities.—Mr. Clarke found a single specimen of this species in a greyish sandstone near Maitland. Mr. Morris found it at Spring Hill, Tasmania.

PTERINEA LATA, *F. McCoy.*

Pl. XVI, Fig. 11.

Pteronites latus, F. McCoy, 1844, Synop. Carb. Foss. Ireland, p. 81, pl. 13, fig. 7.

Avicula lata, A. d'Orbigny, 1850, Prod. Pal., I, p. 135.

This is an elongated, depressed, subtriangular shell of moderate size, and angular at the anterior extremity. The posterior margin is sinuous and joined by a regular curve to the ventral margin. The beak is small and placed at a short distance from the anterior extremity. The anterior ear is small and not distinct, the posterior is very large and ends in a sharp point. The hinge line is straight, slightly exceeds the anal margin, and so is a little longer than the shell proper. Two or three thin, long teeth, almost parallel with the hinge line, compose the back part of the hinge. The external surface is nearly smooth, being crossed only by indistinct concentric lines of growth near the margins and towards the end of the posterior ear.

Dimensions.—The length is three and a half centimetres, the breadth twenty-seven millimetres, and the thickness of the left valve two millimetres.

Relations and Differences.—I agree with Woodward that there is no well-marked difference between *Pterinea* and *Pteronites.* The presence of the posterior teeth on the species I have just described leaves no doubt in this case. It differs from *P. angustata,* McCoy, by its much greater breadth, and by it sinuous anal margin.

Horizon and Localities.—It is found in the Millicent limestone, Ireland, and in the limestone on the Upper Williams River, Australia.

Genus—AVICULA, *Linnæus.*

AVICULA SUBLUNULATA, *L. G. de Koninck.*

Pl. XVI, Fig. 4.

This shell is of medium size, subequivalved, elongated, and slightly oblique. Its hinge line is shorter than the antero-posterior diameter of the shell. The beaks are nearly terminal. The anterior ear is very small, the posterior rather long and produced by an oblique keel-shaped gibbosity, extending from the beak to the posterior extremity of the ventral margin, which is slightly arched. The posterior margin is obliquely truncated and rather sinuous. The surface is covered with irregular, concentric rings of growth. This small species has a relatively large hinge area nearly a millimetre broad.

Dimensions.—The length is twenty-seven, the breadth ten to eleven, and the thickness of the right valve five to six millimetres.

Relations and Differences.—It is rather like *A. lunulata,* Phillips, but differs from it by being narrower and much less oblique. Perhaps it is identical with *Cypricardia imbricata,* Dana, which seems to me to be an *Avicula,* but I have had no opportunity of comparing them in nature.

Horizon and Localities.—A single internal cast of this species was found in a yellowish sandstone at Muree.

AVICULA HARDYI, *L. G. de Koninck.*

Pl. XVI, Fig. 10.

This shell is small, elongated, subrhomboidal, and crossed obliquely by a keel-shaped gibbosity, which starts at the beak and extends to the posterior extremity of the ventral margin, there dividing into two nearly equal parts. The beak is terminal, small, and recurved. Immediately below it is a very small ear, produced by a decided sinuosity corresponding to the byssal notch. The ventral margin is slight arched, and the anal margin obliquely truncated. The surface is ornamented with small concentric lines of growth, scarcely perceptible to the naked eye.

Dimensions.—The length is about twenty, the breadth eleven, and the thickness of the left valve three millimetres.

Relations and Differences.—This species differs from *A. inconspicua,* Phillips, by the anterior position of its beaks, and by the sinuosity giving rise to the anterior ear.

Horizon and Localities.—The only specimen sent me came from Burragood.

AVICULA DECIPIENS, *L. G. de Koninck.*

Pl. XXII, Fig. 13.

Shell of the same size as the preceding, suboval, elongated, nearly twice as long as broad, and slightly inequivalved. Although the valves are shallow, their large and triangular posterior wing is distinctly marked and strongly depressed. The small, non-prominent beaks are placed at a short distance from the anterior margin. The anterior ears are indistinct. The surface was covered with indistinct, irregular, concentric undulations. The impression of the adductor is rounded, relatively large, and posterior.

Dimensions.—The length is twenty-one, breadth fourteen, and thickness seven millimetres.

Relations and Differences.—It resembles the preceding species in size and anterior ornaments; but differs by its relative thinness, and by the much less anterior position of its beaks.

Horizon and Locality.—It accompanies *A. intumescens* in the blackish-grey limestone at Harper's Hill. I have seen but one specimen of it.

AVICULA INTUMESCENS, *L. G. de Koninck.*

Pl. XXII, Fig. 12.

This is a rather small, subequivalved, subtrigonal, gibbous, oblique shell, longer than broad. It is much broader posteriorly than on the opposite side. Its posterior ear is depressed, triangular, and well developed, and is attached to the rest of the shell by a rather abrupt slope. The beaks are anterior and thick. The ventral margin is slightly sinuous. The right valve is rather smaller and shallower than the left. The cast has preserved traces of the thin concentric lamellæ with which the surface was probably covered. The impression of the adductor muscle is small and close to the beaks. Another much smaller impression is found in the hollow of the beak, and served as the point of attachment for the byssus.

Dimensions.—The length is twenty-two, breadth sixteen, and thickness thirteen millimetres.

Relations and Differences.—In shape it resembles *A. quadrata*, Sowerby. It also resembles my *A. Hardyi*, but differs from it by thickness, the anterior position of its beaks, and its surface ornamentation.

Horizon and Locality.—A single specimen was found in a dark, grey limestone at Harper's Hill.

Class—PTEROPODA.

Genus—CONULARIA, *Miller*.

CONULARIA TENUISTRIATA, *F. McCoy*.[1]

Pl. XXIII, Fig. 2.

Conularia tenuistriata, F. McCoy, 1847, Ann. Mag. Nat. Hist., XX, p. 307, pl. 17, fig. 7, 8.

This is a quadrangular, pyramidal shell, rhomboidal in section with very unequal sides; the breadth of the narrow sides is barely half that of the long sides. Its apical angle measures only ten degrees by the goniometer, and a length of from ten to eleven centimetres may be assumed for the specimen figured by McCoy. At each of the four angles is a narrow groove at the bottom of which the extremities of the transverse ribs of the two adjacent faces recurve upwards (towards the apex) alternating with each other. The ribs are slightly arched and interrupted on each of the four faces by a median line traversing the shell from apex to base, and they are separated from each other by small, oblique furrows, striated in the direction of the main axis; they are very numerous, about nineteen to each centimetre of length.

Relations and Differences.—This *Conularia* greatly resembles *C. Geroldsteinensis*, d'Archiac and de Verneuil, in the number and form of its transverse ribs; it differs principally by the apical angle of its broad side which is only ten degrees, while that of the Devonian species is fifteen degrees, and by the absence of granulations which cover the ribs of C. *Geroldsteinensis*. It is also closely allied to *C. Brongniarti* by its apical angle and intercostal striæ, but it differs by having many more ribs in a given space and by giving a different transverse section.

Horizon and Localities.—So far this species has been found only in the micaceous sandstone at Muree.

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[1] [Waagen, Records Geol. Survey India, 1886, XIX, p. 26, t. 1, f. 3; Salt Range Fossils (Pal. Indica), 1891, IV, Pt 2, p. 125, t. 5, f. 2, 3.—W.S.D.]

CONULARIA QUADRISULCATA, *Miller.*

Pl. XXIII, Fig. 3.

A curious fossil,	D. Ure, 1793, Hist. Rutherglen, p. 330, pl. 20, fig. 7.
Conularia quadrisulcata,	Miller, 1821, in J. Sowerby's Min. Conch., III, p. 107, pl. 260, fig. 3, 4, and 5 (non idem Sowerby, in Murchison's Silurian System, nec Hisinger).
,, ,,	J. de Carle Sowerby, 1834, Trans. Geol. Soc. London, V (2), p. 492, pl. 40, fig. 2.
,, ,,	F. McCoy, 1844, Synop. Carb. Foss. Ireland, p. 26.
,, *tuberi-costa,*	G. Sandberger, 1847, Neues Jahrb. für Min , p. 21, pl. 1, fig. 12.
,, *quadrisulcata,*	F. McCoy, 1855, Brit. Pal. Foss., p. 528.
,, ,,	F. Roemer, 1874, Lethæa Geogn., Atlas, pl. 45, fig. 5.

This shell is rhomboidal in cross section, and of medium size, its small sides differing little from the large sides. The angles are occupied by a shallow and rather narrow furrow, in which the transverse ribs of the surface end alternately. Between two ribs on each side of the furrow there is a very short and regularly alternate small transverse protuberance, which I can only compare to a narrow band, furnished on both sides with small alternate teeth. The sides are flat, and covered with numerous transverse folds, a little more closely packed towards the upper extremity than elsewhere. These folds are nearly continuous, or only slightly interrupted in the centre, arched, convex from the side of the opening, and often granulose; the furrows separating them are broader than the folds themselves. In good specimens, with a lens, one can see irregular transverse striæ at the bottom of these furrows.

Dimensions.—The incomplete specimen I have described is only twenty-three millimetres long. The apical angle of the large size is 20°. Towards the middle of its length there are twenty-four folds for each ten millimetres of length.

Relations and Differences.—On account of the rarity of most species of *Conularia,* and the difficulty of procuring authentic specimens for comparison, this species has often been confused with others most unlike it. Sowerby confuses it with a Silurian species lately dedicated to him by Defrance. I think, with Verneuil and McCoy, that the name *C. quadrisulcata* should be strictly reserved for the species to which Miller gave the name, and which Sowerby has represented in Pl. 260, Fig. 5 of the Mineral Conchology. At any rate, I consider the figure on the same plate belongs to another species very like my *C. irregularis*, if it is not the same. All the species just mentioned differ from *C. quadrisulcata* by their apical angle, by their surface ornamentation, or by the number of transverse folds in a given space.

Horizon and Localities.—The example of *C. quadrisulcata*, which seems to me a typical specimen, was found by Miller in the lower beds of the Carboniferous Limestone near Bristol. It is generally supposed to be the same as that found abundantly at Gare, near Carluke, Scotland; also at Broseley, and at some places in Coalbrookdale. The only specimen sent me from Australia was found in a brownish argillaceous limestone at Buchan, on the Gloucester.

CONULARIA LÆVIGATA, *J. Morris*.[1]

Pl. XXIII, Fig. 1.

Conularia lævigata, J. Morris, 1842, in Strzelecki's Phys. Descr. N. S. Wales and V. D. Land, p. 290, pl. 18, fig. 9.

„ „ F. McCoy, 1847, Ann. Mag. Nat. Hist., XX, p. 306.

„ „ J. D. Dana, 1849, Geol. Wilkes' U. S. Explor. Exped., p. 710, pl. 10, fig. 9.

This is an elongated pyramidal shell, rectangular in section. The four faces are flat, or slightly depressed in the middle; the angles are occupied by a simple shallow groove, into which the transverse folds of the surface jut alternately. These very slightly arched folds are convex from the side of the opening, and slightly interrupted in the middle by an indistinct longitudinal rib, which occasionally makes them alternate with each other. The folds are thin and sharp, and separated by smooth furrows much broader than the folds themselves. There are eleven or twelve to each length of ten millimetres.

Dimensions.—This species reaches a great length, if one may judge by the very slight convergence of the sides of these fragments, a convergence that indicates an extremely sharp apex, the angle of which would be of a very few degrees.

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[1] [Waagen, Records Geol. Survey India, 1886, XIX, p. 25, t. 1, f. 1; Salt Range Fossils (Pal. Indica), 1891, IV, Pt. 2, p. 123, t. 3, f. 1, 2, t. 4, f. 5.—W.S.D.]

Relations and Differences.—Morris compares this species with *C. irregularis*, de Koninck; it differs by its small apical angle, by its greater length, and by the much greater distance between the transverse folds. The grooves separating the folds in *C. irregularis* have nearly the small breadth as the folds, and number eighteen or nineteen in a length of ten millimetres, while in *C. lævigatus* there are only eleven or twelve in the same space.

Horizon and Localities.—According to McCoy and Dana this species is abundant in the limestone at Harper's Hill, and in the micaceous sandstone at Black Creek. Messrs. Clarke and Morris found it in a brown micaceous sandstone at Muree Quarry, Raymond Terrace, where it is associated with *C. tenuistriata*, McCoy, and fragments of plants among which Crepin thinks he recognises *Schizopteris*.

CONULARIA INORNATA, *J. D. Dana.*[1]

Pl. XXII, Fig. 14.

Conularia inornata, J. D. Dana, 1849, Geol. Wilkes' U. S. Explor. Exped., p. 709, pl. 10, fig. 8.

This large and beautiful pyramidal shell is rectangular in section, the small sides having only three-quarters the breadth of the large sides. The four faces are depressed, and faintly grooved in the middle; the folds ornamenting them are slightly arched, and those of the large faces are also oblique to the main axis of the shell. The apical angle is only 10° or 12°. The side angles are occupied by a broad groove, at the bottom of which is a distinct rib, produced by the raising of the ends of the transverse folds, which jut into the groove, giving it the appearance of a double longitudinal canal. The transverse folds are smooth, and most of them are interrupted in the middle of their length by a small midrib, which is present on all four faces of the shell; they are not very close together, numbering only nine or ten for every ten millimetres of length.

Dimensions.—One of the fragments of this beautiful species is twenty-six centimetres long. The specimen would be at least forty centimetres long if the summit were complete, although the diameter of the base is only four centimetres.

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[1] [R. Etheridge, Junr., Procs. Linn. Soc. N.S. Wales, 1890, IV (2), p. 751, t. 20, f. 1.—W.S.D.

Relations and Differences.—This beautiful species resembles the preceding by the form of its folds and the distance between them; it differs by the shape of its cross section, the long sides of which are relatively longer than those of *C. lævigata;* it differs most decidedly by the double canal and its angles, and by the obliquity of its transverse folds. This last might be accidental.

Horizon and Localities.—According to Dana this species is found at Glendon. The only specimen sent me was found by the Rev. W. B. Clarke in a grey micaceous sandstone about one and a half miles from Maitland.

Class—GASTEROPODA.

Order—PROSOBRANCHIATA.

Genus—DENTALIUM, *Linnæus.*

Dentalium cornu, *L. G. de Koninck.*

Pl. XXIII, Fig. 4.

This is a small recurved shell, ending in a sharp point at its lower extremity; its surface is smooth, and its test relatively thick. The only specimen I have seen is deformed by pressure, so that I cannot give the exact shape of its transverse section. By uplifting a small piece of the test towards its lower extremity I saw that it was grooved, not chambered, therefore I could refer it to its genus.

Dimensions.—This specimen was only fifteen millimetres long, but probably the species can reach a much greater size. Its greatest transverse diameter was three millimetres.

Relations and Differences.—McCoy has described a small Carboniferous species, *D. inornatum,* but it is very unlike this one, being much less conical and much thinner, so that it cannot be confounded with this.

Horizon and Localities.—*D. cornu* was found in a grey argillaceous limestone near Karua.

Genus—PLATYCERAS, *Conrad.*

PLATYCERAS ANGUSTUM, *J. Phillips.*

Pl. XXIII, Fig. 7.

Pileopsis angustus,	J. Phillips, 1836, Geol. Yorkshire, II, p. 224, pl. 14, fig. 20.
Acroculia angusta,	J. Morris, 1843, Cat. Brit. Foss., p. 137.
„ *angustata,*	F. McCoy, 1844, Synop. Carb. Foss. Ireland, p. 44.
Capulus neritoides,	H. G. Bronn, 1848, Index Pal., p. 214 (non Phillips).
„ *angustus,*	J. Morris, 1854, Cat. Brit. Foss., 2nd edit., p. 239.

The shell of this species is not symmetrical, its right side being much more developed than the left, which is depressed laterally to such an extent that its aperture is obliquely oval; the rest agrees perfectly with the figure given by Phillips. Its apical extremity is very pointed, and is whorled obliquely, forming nearly two spiral turns in contact. The surface is nearly smooth, showing only distinct lines of growth.

Dimensions.—The height is thirteen millimetres, and the largest diameter of the aperture sixteen millimetres.

Relations and Differences.—This species is closely related to *P. vetustum,* Sowerby, *P. procumbens,* De Ryckholt, and *P. trilobus,* Phillips, from which it differs by the greater asymmetry of its sides, by its more oblique and oval aperture, by the contiguity and stronger curve of the spire.

Horizon and Localities.—Phillips found it in the Upper Carboniferous Limestone at Bolland, in Yorkshire. The Australian specimen came from Burragood.

PLATYCERAS TRILOBATUM, *J. Phillips.*

Pileopsis ? trilobus,	J. Phillips, 1836, Geol. Yorkshire, II, p. 224, pl. 14, fig. 12, 13.
Capulus vetustus,	L. G. de Koninck, 1842, Descr. Anim. Foss., p. 332 (non Sow.).
Platyceras trilobatum,	J. Morris, 1843, Cat. Brit. Foss., p. 157.
Acroculia triloba,	F. McCoy, 1844, Synop. Carb. Foss. Ireland, p. 45.

Capulus vetustus (partim.), H. G. Bronn, 1848, Index Pal., p. 217 (non Sow., sp.).
,, *trilobatus*, J. Morris, 1854, Cat. Brit. Foss., 2nd ed., p. 239.

This is a nearly symmetrical shell, rather raised, ending in a blunt extremity, curved on itself but not whorled, and keeping at some distance from the posterior margin of the aperture. The aperture is trilobed and wide open, the posterior or dorsal lobe being more pronounced than the others. The surface is usually covered with indistinct lines of growth.

Dimensions.—The specimen figured by Phillips is thirty millimetres high, and the transverse diameter of its aperture about twenty-three millimetres. The Australian specimen just described is only twenty-four millimetres high, and is too badly preserved for me to figure it, or to measure the diameter of its aperture.

Relations and Differences.—It is so like *P. vetustum*, Sowerby, as to be easily mistaken for it. I made this mistake in 1842, and other Authors have done the same since. The chief difference is that in *P. trilobatum* the posterior lobe is always more pronounced than in *P. vetustum*, and in the latter the apical extremity always terminates in a small spire, which is entirely wanting in *P. trilobatum.*

Horizon and Localities.—This is found with the preceding.

PLATYCERAS ALTUM, *J. D. Dana.*[1]

Pl. XXIII, Fig. 5.

Pileopsis alta, J. D. Dana, 1849, Geol. Wilkes' U. S. Explor. Exped., p. 707, pl. 9, fig. 14.

This species, of which I know only a small specimen, is rather straight and laterally compressed. Its dorsal part is arched, and its apex pointed and recurved forward so as to overhang the aperture when placed horizontally. The aperture is oval, and its antero-posterior diameter nearly double the transverse diameter. The surface is nearly smooth showing only rings of growth.

Dimensions.—The height is five millimetres, and the transverse diameter three millimetres.

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[1] [*Platyceras (Orthonychia) altum*, Dana? R. Etheridge, Junr., Records Geol. Survey N. S. Wales, 1896, v, p. 15, t. 1, f. 1, 2.—W.S.D.]

Relations and Differences.—This species differs from *P. tenella*, J. Dana, by its greater relative height, and its more elliptical aperture.

Horizon and Localities.—According to Dana this species was found at Harper's Hill. Mr. Clarke found it at Pallal on the Gwydir.

PLATYCERAS TENELLA, *J. D. Dana.*

Pl. XXIII, Fig. 6.

Pileopsis tenella, J. D. Dana, 1849, Geol. Wilkes' U. S. Explor. Exped., p. 786, pl. 9, fig. 13.

This is a small, conical, recurved shell, with an oval aperture. It terminates at its posterior end in a sharp and prominent point. Its surface is smooth.

Dimensions.—Its height is six millimetres, and the antero-posterior diameter of its aperture eight millimetres.

Relations and Differences.—As I am not certain that this and the preceding species are not young individuals of an unknown species with more decided characteristics, I have reserved for them, tentatively, the names under which Dana figured and described them. *P. tenella* differs from *P. altum* by being less high, and by having a relatively broader and more oval aperture.

Horizon and Localities.—According to Dana it is found in the limestone at Harper's Hill. Mr. Clarke found it in a grey limestone at Colocolo.

Genus—PORCELLIA, *Levielle.*[1]

PORCELLIA WOODWARDII, *W. Martin.*[2]

Pl. XXIII, Fig. 8.

Conchyliolithus N. Ammonites Woodwardii, W. Martin, 1809, Petrif. derbiensis, p. 17, pl. 35, fig. 4, 5.

Nautilus Woodwardii, J. de Carle Sowerby, 1829, Min. Conch., VI, p. 138, pl. 571, fig. 3.

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[1] [*Léveillia*, R. B. Newton, Geol. Mag., 1891, VIII (3), p. 203.—W.S.D.]

[2] [*Léveillia Woodwardi*, R. B. Newton, Geol. Mag., 1891, VIII (3), p. 207.—W.S.D.]

Bellerophon	*Woodwardii,*	J. Phillips, 1836, Geol. Yorkshire, II, p. 231, pl. 17, fig. 1, 2, 3 (non idem, Pal. Foss., p. 107, pl. 40, fig. 201).
,,	,,	A. d'Orbigny, Mon. Genre Bellerophon, pl. 6, fig. 17–19.
Porcellia	,,	L. G. de Koninck, 1844, Descr. Anim. Foss. Terr. Carb. Belg., p. 360, pl. 28, fig. 2.
,,	,,	J. Morris, 1854, Cat. Brit. Foss., p. 289.

This shell has much the same appearance as the Ammonites, and was at first confounded with them. It is discoidal and concave at both sides. There are seven or eight whorls, which do not clasp each other but are angular at both sides; their external transverse section is sub-pentagonal. The surface is ornamented with small granulations arranged in a longitudinal series parallel to the dorsal canal with which the last whorl of the spire is furnished; these granulations appear to have been produced by the intersection of very fine, and at the same time deep, striæ, some of which are longitudinal to the spiral whorls on which they originate, and the others, rather more pronounced, cross the first vertically, recurving a little backwards, so as to form lines parallel with the aperture of the shell. On account of the relatively great thickness of the shell the aperture is rounded or slightly transverse. Although the several turns of the spire seem regularly whorled on the same plan, and although both sides of the shell are very concave, yet it is easily seen that one of these sides is a little larger than the other, and that the first whorls of the spire project slightly; this is positive proof of the relationship existing between *Porcellia* and *Pleurotomaria*, in which the external edge of the aperture has a slit which by its gradual obliteration gives rise to the formation of a band as long as the spiral whorls.

Dimensions.—This species can acquire a diameter of about three centimetres. The diameter of the largest Australian specimen is only eleven millimetres.

Relations and Differences.—This differs from *P. Puzo*, Leveillé, by the angularity of its whorls, and by the complete absence of the large tubercles independent of the granulations which ornament its surface.

Horizon and Localities.—This species is found in the Visé and Waulsort Limestone, Belgium, at Bolland and Kulkeagh, Yorkshire, and in the limestone at Winster and Brassington, Derbyshire. In New South Wales it is found at Burragood. I greatly doubt if the Devonian species described under this name by Phillips belongs to this species.

Genus—PLEUROTOMARIA, *Defrance.*

PLEUROTOMARIA MORRISIANA, *F. McCoy.*

Pl. XXIII, Fig. 12.

Pleurotomaria Morrisiana, F. McCoy, 1847, Ann. Mag. Nat. Hist., XX, p. 306, pl. 17, fig. 5.

„ „ J. D. Dana, 1849, Geol. Wilkes' U. S. Explor. Exped., p. 706, pl. 9, fig. 15 (fig. 16 exclusâ).

This shell is conical, a little longer than broad, makes four or five convex spiral whorls, and is furnished with a projecting double keel, limiting the band of the sinus. Its suture is rather deep, and placed immediately under the keel. The rest of the surface is ornamented with oblique lines of growth. The aperture is sub-circular, and there is no umbilicus.

Dimensions.—The length is seven, and breadth five, millimetres; the apical angle is about 60°.

Relations and Differences.—By its surface ornamentation this species resembles my *P. Galeottiana;* it differs from it by the convexity of its whorls and its more rounded aperture. I am convinced that Dana has confused two distinct species under the name *P. Morrisiana*, and that the specimens he has figured (Fig. 16, Pl. 9) are specifically, or even generically, different from those represented on Fig. 15, Pl. 9. It is easily seen that their ornamentation and spiral angles are too unlike to admit of their being the same species.

Horizon and Localities.—This small species appears to be abundant in the limestone near Munnawarra (Black Head). McCoy says it is found in the Muree Sandstone.

PLEUROTOMARIA SUBCANCELLATA, *J. Morris.*

Pl. XXIII, Fig. 15.

Pleurotomaria subcancellata, J. Morris, 1845, in Strzelecki's Phys. Descr. N. S. Wales and V. D. Land, p. 288, pl. 18, fig. 6.

„ „ McCoy, 1847, Ann. Mag. Nat. Hist., XX, p. 305.

This shell, of relatively large size, is conical, and consists of six spiral whorls; the lower part of the spire is depressed, and the depression gives rise to the formation of an obtuse angle towards its lower third, while the anterior two-thirds are convex. The band of the sinus is well-marked, and placed immediately under the angle of the spire; it has numerous semicircular striæ caused by the slit of the sinus, and lines of growth. The rest of the surface is ornamented with innumerable longitudinal striæ crossed perpendicularly by other striæ equally numerous, and thus producing a uniform reticulated design. The umbilicus is very broad and deep, and the aperture transverse.

Dimensions.—Having only an imperfect specimen of this beautiful species at my disposal, I cannot give the exact measurements. The specimen figured by Mr. J. Morris has a spiral angle of about 75°, and ought to have a length and breadth of about sixty-five millimetres.

Relations and Differences.—In form and size this species resembles *P. delphinuloides*, Goldfuss; it differs from it by its ornamentation, the shape of its aperture, and the narrowness of the band of its sinus.

Horizon and Localities.—I have been able to demonstrate the existence of this species in the micaceous sandstone of Muree. McCoy says it is found at Loder's Creek, and Morris records its occurrence in the Illawarra.

PLEUROTOMARIA STRIATA, *J. Sowerby*.

Pl. XXIII, Fig. 11.

Helix striatus,	J. Sowerby, 1828, Min. Conch., II, p. 159, pl. 171, fig. 1.
Turbo „	A. Dumont, 1832, Const. Géol. Prov. Liége, p. 353.
„ „	Davreux, 1833, Const. Géogn. Prov. Liége, p. 271.
Pleurotomaria striata,	J. de C. Sowerby, 1834, Indices Min. Conch., p. 247.
„ „	J. Phillips, 1836, Geol. Yorkshire, II, p. 226.
Ptychomphalus striatus,	L. Agassiz, 1838, Traduct. Conch. Min. de Sowerby, p. 222, pl. 115, fig. 1, 2, 3.
Pleurotomaria striata,	L. G. de Koninck, 1843, Descr. Anim. Foss. Terr. Carb. Belg., p. 399, pl. 31, fig. 2.
„ *Hainesii*,	F. M'Coy, 1844, Synop. Carb. Foss. Ireland, p. 41, pl. 3, fig. 8
„ *striata*,	F. McCoy, 1855, Brit. Pal. Foss., p. 529.

This is a slightly conical shell composed of five or six convex spiral whorls, the upper edge of which is provided with a rather projecting, nearly smooth, double keel, bounding the band of the sinus, and covered with numerous small arched scales. The upper keel being covered by the whorl of the spire the double keel is seen best on the last whorl, which is slightly depressed above. The upper surface is ornamented with numerous, radiating, slightly wavy striæ, bifurcating frequently towards their exterior extremity. The striæ of the first whorls of the spire are obliquely transverse and scarcely waved at all. The slit is deep, and occupies nearly one-fourth of the total length of the last whorl of the spire. The umbilicus is obliterated by a rather strong callosity. The aperture is large, transverse, and sub-rectangular.

Dimensions.—This shell can reach a length of about two centimetres, and a breadth of twenty-six millimetres; its spiral angle is about 86°.

Relations and Differences.—This species evidently belongs to the same group as *P. carinata* and *P. conica*, Sowerby. Its shell, like theirs, is often marbled or entirely coloured black, but it is smaller. It differs from *P. carinata* by the absence of the umbilicus, and by the depth of the striæ, and from *P. conica* by the greatness of its spiral angle, and by the suture of the spire, which is directly joined to the keel, while in *P. conica* it is at some distance from the keel.

Horizon and Localities.—This species was found by Sowerby in the Carboniferous Limestone of Derbyshire. I have rarely seen it in that of Visé. Mr. Clark found a single specimen of it in a yellowish argillaceous limestone at Duguid's Hill.

PLEUROTOMARIA GEMMULIFERA, *J. Phillips.*

Pl. XXIII, Fig. 9.

Pleurotomaria gemmulifera,	J. Phillips, 1836, Geol. Yorkshire, II, p. 227, pl. 15, fig. 18.
" "	L. G. de Koninck, 1843, Descr. Anim. Foss. Terr. Carb. Belg., p. 370, pl. 31, fig. 7.

This shell is of moderate size, subconical, broader than long, composed of five slightly-convex spiral whorls, separated from each other by a shallow, linear suture. Their surface is ornamented with small, longitudinal, parallel ribs, furnished with small, slightly imbricated granulations. The grooves separating these ribs are crossed by fine oblique striæ of growth. The number of ribs varies with the age, and is increased progressively by the insertion of a new rib from the side of the suture; the last whorl in an adult specimen has thirteen ribs and a double keel, the lower one of which is the most pronounced. Between the keels is a moderately broad band of the sinus, which is itself covered with fine ribs barely visible to the naked eye. The upper surface of the base is depressed and furnished with eight or nine indistinct ribs, parallel with the band, and crossed by lines of growth, but not granular. The umbilicus is of moderate size, funnel-shaped, and smooth. The aperture is transverse and angular.

Dimensions.—This species can reach twelve or fifteen millimetres in diameter, and a length of eight or ten millimetres.

Relations and Differences.—It is related to *P. radula*, de Koninck, by the number and regularity of its ribs, and by the granulations covering them.

Horizon and Localities.—It is found in the Upper Carboniferous Limestone of Bolland, Yorkshire, and of Visé, Belgium. A single specimen was found in a greyish limestone, in a railway cutting between Maitland and Stony Creek.

PLEUROTOMARIA HUMILIS, *L. G. de Koninck.*[1]

Pl. XXIII, Fig. 14.

This shell is of medium size, sigaretiform, and composed of three or four convex, spiral whorls slightly clasping, the last of which rapidly takes a considerable development. The surface is ornamented with numerous fine, longitudinal ribs, crossed perpendicularly by equally fine lines of growth. The band of the sinus is separated from the rest of the surface by two furrows, rather deeper than those separating the ribs. This species has no umbilicus; its columella is very oblique; its aperture is large and transversely oval; its exterior margin is thin, and slightly sinuous in the middle.

Dimensions.—The length is about fifteen millimetres, and the transverse diameter of the last whorl twenty millimetres.

Relations and Differences.—This species is very like my *P. Frenoyana*, but it differs in the proportions of its length and breadth, and also by its band which is not grooved, and by the transverse form of its aperture.

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[1] [*Mourlonia humilis*, R. Etheridge, Junr., Procs. Linn. Soc. N. S. Wales, 1889, IV (2), p. 205; S. Austr. Parl. Papers, 1897, No. 127, p. 15, t. 1, f. 11 (?).—W.S.D.]

Horizon and Localities.—A single incomplete specimen was found in the sandstone at Raymond Terrace. Mr. R. Etheridge, Jun., found it in a greyish limestone near Edinburgh.

PLEUROTOMARIA NATICOIDES, *L. G. de Koninck.*

Pl. XXIII, Fig. 10.

Pleurotomaria naticoides, L. G. de Koninck, 1843, Descr. Anim. Foss. Terr. Carb. Belg., p. 405, pl. 31, fig. 8.

„ „ *Idem,* 1873, Rech. Anim. Foss., II, p. 101.

This shell is sub-discoidal, of medium size, with a flattened spire composed of seven or eight whorls, rather strongly keeled. That part not covered by the various whorls is strongly depressed and very slightly convex. Two-thirds of the upper surface are smooth, while the lower third is ornamented with small, slightly arched, radiating striæ, arising from the suture. The narrow and projecting band of the sinus remains visible on all the whorls following the suture. The upper part of the last whorl of the spire is very convex. The umbilicus is broad and funnel-shaped. The aperture is transverse and sub-rhomboidal, and its slit is rather deep.

Dimensions.—This shell never attains a great size, its length rarely exceeding one centimetre, while its breadth reaches three. Its spiral angle is about 130°.

Relations and Differences.—It differs from *P. expansa,* Phillips by its much more discoidal form, and its relatively greater length.

Horizon and Localities.—I have found this species in the Upper Carboniferous Limestone of Visé, where it is rare. Mr. Clarke found a single specimen of it at Harper's Hill. I have found it among the fossils of Bleiburg in Carinthia, and Mr. J. Thomson obtained it near Glasgow.

PLEUROTOMARIA HELICINÆFORMIS, *L. G. de Koninck.*

Pl. XXIII, Fig. 13.

This is a small, sub-globular shell, nearly as long as broad, composed of five convex spiral whorls, with a rather deep suture. The last whorl of the spire is relatively well developed, and has a slightly projecting band in the middle, which is rather broad in comparison with the size of the shell. The umbilicus seems to me deep and funnel-shaped. The surface is perfectly smooth.

Dimensions.—The length of this small shell does not exceed three millimetres, and its breadth three and a half millimetres. It may possibly be only a young individual of a larger species.

Relations and Differences.—Mr. McCoy has described a small species, very like this, under the name *P. lævis.* It differs by being more discoidal, more depressed, and especially by having a relatively much narrower band, also by the less elevated position of this band in the spire, which last circumstance allows it to be seen on all the whorls, while it is visible only on the last whorl in *P. helicinæformis.*

Horizon and Localities.—A single specimen was found in the brown argillaceous limestone at Burragood.

Genus—MURCHISONIA, *d'Archiac and de Verneuil.*

MURCHISONIA TRIFILATA, *J. D. Dana.*

Pleurotomaria trifilata, J. D. Dana, 1847, Am. Journ. Sci., IV (2), p. 151.

„ *Morrisiana, Idem,* 1849, Geol. Wilkes' U.S. Explor. Exped., p. 706, pl. 8, fig. 16 (fig. 15 exclusa, non F. McCoy).

This is an elongated conical shell of moderate size, composed of seven or eight spiral whorls, with a triple keel, the top one of which is obsolete and follows the rather deep suture. The two inferior keels serve to limit the band of the sinus, which is grooved and covered with small plates of growth. The upper part of the last whorl is convex. The shell has no umbilicus; its aperture is oblong ovate, and its slit seems to have been deep. The whole surface is ornamented with fine, slightly arched, oblique, rather deep and irregular striæ.

Dimensions.—This pretty shell can attain a length of about two centimetres, and a diameter of from nine to ten millimetres. Its spiral angle is about 51°.

Relations and Differences.—Dana, probably not having good specimens, has confused this with the *Pleurotomaria* that McCoy dedicated to Morris.

It differs not only by its greater relative length, which authorises me to class it with *Murchisonia*, but also by the smallness of its spiral angle, and above all by the triple keel of its whorls, *P. Morrisiana* having only a double keel. Probably it was this triple keel, very well observed and figured by Dana, which suggested to him the name under which he first described it, and which I have adopted. In shape this species resembles my *M. Verneuilliana*, which differs by having only a double keel occupying the middle of the spiral whorls, instead of following the suture as in *M. trifilata.*

Horizon and Localities.—Mr. Clarke sent me a block of greenish, calcareous sandstone, from Harper's Hill, full of specimens of this species. Dana's specimen came from the same locality, while McCoy's came from Muree and Wollongong—beds in which I have found no trace of them.

MURCHISONIA VERNEUILIANA, *L. G. de Koninck.*[1]

Pl. XXIII, Fig. 15.

Murchisonia Verneuiliana, L. G. de Koninck, 1844, Descr. Anim. Foss. Terr. Carb. Belg. p. 414, pl. 38, fig. 5.

This shell is elongated and conical, and composed of seven to ten spiral whorls. The spire is divided nearly in the middle by a small, double, rather narrow, and slightly grooved keel, limiting the band or the sinus. On both sides of the band the spire is nearly flat, except the upper part of the last whorl which is convex. The surface is covered with fine, irregular, slightly oblique lines of growth. The suture is deep; the columella simple, and only slightly sinuous; and the aperture elongated and subrhomboidal.

Dimensions.—Although this shell can reach a length of about three centimetres, the Australian specimens are scarcely a third that length, and their diameter is only seven millimetres. The spiral angle is forty-one degrees.

Relations and Differences.—This species was considered by E. de Verneuil identical with the species from Paffrath, that he described under the name *M. angulata;* but it must not be confounded with another species to which Phillips has given the same name. It differs from it by its small size and its much greater spiral angle. It follows from this last characteristic that for the same length the diameter of the Devonian *Murchisonia* is relatively less than that of the Carboniferous species. The absence of the third keel on the whorls makes it impossible to confound this with the preceding species.

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[1] [In the original there are two Figs. 15. That of *Murchisonia Verneuiliana* is placed between Figs. 7 and 23. -W.S.D.]

Horizon and Localities.—This species is rather rare in the Upper Carboniferous Limestone at Visé. It was found in a dark grey limestone at Munawarra (Black Head).

Genus—EUOMPHALUS, *Sowerby.*

EUOMPHALUS OCULUS, *J. D. Sowerby.*[1]

Pl. XXIII, Fig. 18.

Trochus oculus,	J. D. Sowerby, 1838, In T. L. Mitchell's Three Exped. Interior E. Austr., I, p. 15, pl. 2, fig. 3, 4.
Platyschisma oculus,	J. Morris, 1845, In Strzelecki's Phys. Descr. N. S. Wales and V. D. Land, p. 286, pl. 18, fig. 1.
,, ,,	F. McCoy, 1847, Ann. Mag. Nat. Hist., XX, p. 306.
,, ,,	J. D. Dana, 1849, Geol. Wilkes' U. S. Explor. Exped., p. 707, p. 10, fig. 1.

This is a rather large, suborbicular shell, with a short, depressed spire, composed of four or five slightly convex whorls, the last of which is well developed and obtusely keeled towards its upper margin. The sutures are shallow. The aperture is oblique, nearly circular, and shows only a slight angularity from the side of the lower canal joining the suture of the last whorl. The columella is simple and rather thick. The umbilicus is deep but not large. The upper part of the last whorl is convex. The whole surface is ornamented with oblique lines of growth, slightly wavy towards the keeled part of the base. The shell is fibrous.

Dimensions.—It is capable of reaching large dimensions. The specimen figured by Strzelecki was about five centimetres long by seven broad; that figured by Dana is larger but slightly deformed.

Relations and Differences.—In shape this species resembles *E. helicoïdes,* Sowerby, and could easily be confounded with it, it differs by the excessive thinness of its shell, and by the almost complete absence of the lines of growth on its surface. It differs also by the fibrous structure of the shell, a structure not possessed by the species to which I have compared it.

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[1] [*Platyschisma oculum. Vide* R. Etheridge, Junr., Geol. and Pal. Q'land., 1892, p. 286, t. 15, f. 3, 4; Records Geol. Survey N. S. Wales, 1898, V, p. 176, t. 19, f. 14–17 —W.S.D.]

Horizon and Localities.—It is rather abundant in a greenish, arenaceous limestone at Harper's Hill, where it is associated with a great number of ***Murchisonia trifilata***, Dana. One specimen was found in a yellowish sandstone at Branxton.

EUOMPHALUS MINIMUS, *F. McCoy.*

Pl. XXIII, Fig. 17.

Euomphalus minimus, F. McCoy, 1847, Ann. Mag. Nat. Hist., XX, p. 305, pl. 17, fig. 4.

This is an extremely small, rounded shell, composed of three or four convex spiral whorls, with a grooved suture, and a depressed spire. The last whorl is relatively well developed and convex at the base. The umbilicus is small; the aperture transversely oval; and the surface smooth.

Dimensions.—The diameter of the largest specimen I have seen does not exceed two millimetres; its length is nearly half that.

Relations and Differences.—As this is rather abundant in certain Carboniferous rocks in N.S. Wales, which contain no ***Euomphalus*** of a larger size at all like it, this probably really constitutes a distinct species, and is not a young individual of a larger one, as might be thought. I know of no other Carboniferous ***Euomphalus*** to which it could be compared, or with which it could be confounded.

Horizon and Localities.—According to McCoy this species is common in the shales of Dunvegan. Mr. Clarke found several specimens in the argillacous limestone at Burragood.

EUOMPHALUS CATILLUS, *W. Martin.*[1]

Pl. XXIII, Fig. 19.

Conchyliolithus Helicites catillus,	W. Martin, 1809, Petrif. Derbiensis, p. 18, pl. 17, fig. 1, 2.
Euomphalus catillus,	L. G. de Koninck, 1843, Descr. Anim. Foss. Terr. Carb. Belg., p. 417, p. 24, fig. 10.
,, ,,	Idem, 1873, Rech. Anim. Foss., II, p. 103, pl. 4, fig. 4 (for synonymy).

This is a rather large shell, in the form of a biconcave lens, of which the side corresponding to that of the spire may be a little less hollow than the opposite side which forms the umbilicus. It consists of seven or eight spiral whorls which are in contact but do not envelope each other. The spire is bi-carinated, and subtrapezoidal in section; its several whorls are externally separated from each other by a rather shallow helicoidal groove following the suture. The whole surface is ornamented with irregular lines of growth sufficiently distinct to be visible to the naked eye. The aperture is subtrapezoidal, and nearly as high as broad; it is bi-sinuous, but the sinus of the inferior canal is deeper than that of the superior; its external margin is sharp, prominent, and arched. The umbilicus has the same diameter as the spire, and the same form too, except that the spiral whorls are a little less keeled.

Dimensions.—This species can reach a diameter of sixty-five millimetres, and a height of about twenty-two millimetres. One of the Australian specimens has a diameter of thirty-one millimetres only.

Relations and Differences.—It resembles *E. calyx*, J. Phillips, but is easily distinguished from it by the convexity of the exterior part of the spiral whorls comprised between the two keels, by the much greater concavity of its spire, and the less regular surface of its umbilicus.

Horizon and Localities.—This species is not uncommon in the Upper Carboniferous Limestone of Visé. It is found in the same limestone in Yorkshire, Scotland, and Ireland. Two external casts, one of the spire and the other of the umbilicus, were found by Mr. Clarke seven miles N.W. of Tilleghary. From these two casts I was able to decide the species.

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[1] [Mr. R. Etheridge, Junr., remarks in reference to this fossil—"The shell figured by De Koninck as *E. cattilus*, Martin, a European species, is a very questionable determination, and is probably referable to some other genus." Records Geol. Survey, N. S. Wales, 1896, V, p. 17.—W.S.D.]

Genus—MACROCHEILUS, *J. Phillips.*

MACROCHEILUS FILOSUS, *J. D. Sowerby.*

Pl. XXIII, Fig. 16.

Littorina filosa,	J. D. Sowerby, 1838, In T. L. Mitchell's Three Exped. Interior E. Austr., I, p. 15, pl. 2, fig. 5.
,, ,,	J. Morris, 1845, In Strzelecki's Phys. Descr. N. S. Wales and V. D. Land, p. 285, pl. 18, fig. 4.

This is an elongated turreted shell, composed of six or seven convex spiral whorls, with rather deep sutures. The surface of the first five or six whorls is ornamented with six thin, nearly equidistant ribs parallel with the sutures, and separated by smooth, concave furrows broader than the ribs themselves. The last whorl is rather ventricose, and covered with fourteen or fifteen ribs, the upper ones being rather closer together than the six lower ones. The aperture is elongated and oval.

Dimensions.—The length is fifteen, and the breadth ten, millimetres, and the spiral angle forty-six degrees.

Relations and Differences.—Professor Phillips has figured a species of *Macrocheilus* to which he has given the name *Buccinum (?) parallele* (Geol. Yorkshire, Pl. 16, Fig. 8) having a spiral angle nearly identical with that of this species; its ornamentation is also similar, although the ribs are more numerous. The chief difference between them is that the lower part of the spiral whorls in *Buccinum parallele* has a flat surface, while the spiral whorls of *M. filosus* are regularly convex throughout.

Horizon and Localities.—According to Morris this species is found at Booral. Mr. Clarke found several specimens in a blackish grey limestone on the Karua, in the Ichthyodorulite Range, associated with a species of *Palæarca.*

MACROCHEILUS ACUTUS, *J. de C. Sowerby.*

Pl. XXIII, Fig. 24.

Buccinum,		D. Ure, 1793, Hist. Rutherglen, p. 309, pl. 14, fig. 3.
,,	*acutum,*	J. de Carle Sowerby, 1829, Min. Conch., VI, p. 127, pl. 566, fig. 1 (non idem Trans. Geol. Soc. London, V (2), pl. 57, fig. 23).
,,	,,	J. Phillips, 1836, Geol. Yorkshire, II, p. 230, pl. 16, fig. 11, 21.

Buccinum imbricatum, *Idem*, (1836, *ibid.*, p. 229, pl. 10, fig. 17, 18, 19, 20 (fig. 9 exclusâ) (non Sowerby).

Macrocheilus acutus, L. G. de Koninck, 1843, Descr. Anim. Foss. Terr. Carb. Belg., p. 473, pl. 40, fig. 10, et pl. 41, fig. 13.

„ „ *Idem*, 1878, Rech. Anim. Foss., II, p. 104, pl. 4, fig. 9 (for synonymy).

This is an elongated subfusiform shell, with a regularly pointed spire usually composed of nine or ten convex spiral whorls. In adults the last spiral whorl is large, and constitutes half the total length of the shell. The surface is smooth, or simply ornamented with fine lines of growth. The aperture is elongated and suboval; the columella has an indistinct and small oblique fold, above which are traces of a second still less apparent fold seen only in good specimens; the external peristome of the aperture is thin and obliquely sinuous.

Dimensions.—The length of an adult is from two to three centimetres; the transverse diameter, eight or ten millimetres; and the spiral angle 52° to 53°.

Relations and Differences.—This species differs from *M. imbricatus*, J. Phillips, only by its elongated form, and the difference in its spiral angle.

Horizon and Localities.—This species is very abundant in the Carboniferous Limestone of Visé and in Yorkshire; it is rare in that of Glasgow, and the corresponding shales of Bleiburg, in Carinthia. Mr. Clarke found a single small specimen of it in a brown argillaceous limestone at Burragood.

Genus—LOXONEMA, *J. Phillips.*

LOXONEMA DIFFICILIS, *L. G. de Koninck.*

Pl. XXIII, Fig. 23.

This shell is elongated and conical, and composed of ten or twelve very slightly convex spiral whorls, separated by a linear, shallow, slightly oblique suture. The surface is perfectly smooth.

Dimensions.—The length of the largest specimen sent me is only twenty millimetres; its transverse diameter, nine millimetres; and its spiral angle, 31°.

Relations and Differences.—This species is closely related to my *L. elongata*, to which I at first assigned it. But on close observation one sees that the spiral whorls are much less convex, and that they do not possess the upper inflation which characterises those of the species just named; among this last also the spiral angle is smaller, being only about 24°, while that of *difficilis* is 31°.

Horizon and Localities.—This was found in a grey limestone on the banks of the Karua.

LOXONEMA CONSTRICTA, *W. Martin.*

Pl. XXIII, Fig. 20.

Conchyliolithus Turbinites ?	***constrictus,***	W. Martin, 1809, Petrif. Derbiensis, p. 18, pl. 88, fig. 3.
Melania	***constricta,***	J. Sowerby, 1821, Min. Conch., III, p. 33, pl. 218, fig. 2.
Terebra ?	,,	J. de Carle Sowerby, 1834, Indices Min. Conch., p. 247.
Melania	,,	J. Phillips, 1836, Geol. Yorkshire, II, p. 228, pl. 16, fig. 1.
Loxonema	,,	L. G. de Koninck, 1843, Précis Élémentaire de Géol., par d'Omalius d'Halloy, p. 516.
Chemnitzia	,,	*Idem*, 1843, Descr. Anim. Foss. Terr. Carb. Belg., p. 465, pl. 41, fig. 5.
Loxonema	,,	F. McCoy, 1844, Synop. Carb. Foss. Ireland, p. 30.
,,	,,	A. d'Orbigny, 1850, Prod. Pal., I, p. 117.
? ,,	,,	J. Morris, 1854, Cat. Brit. Foss., p. 255.
,,	,,	L. G. de Koninck, 1873, Rech. Anim. Foss., II, pl. 4, fig. 5.

This shell is conical, elongated, of moderate size, and consists of ten or twelve spiral whorls, the profile of which is slightly sinuous, owing to a gentle swelling towards their upper margin; their lower margin is ornamented with a series of small inflations, or elongated tubercles, produced by the successive growths of the shell, and generally corresponding to very fine striæ produced by the same cause. The aperture is nearly circular, and shows a slight callosity by the side of the columella.

Dimensions.—This shell can reach a length of four or five centimetres, and its last spiral whorl may have a diameter of from fifteen to twenty millimetres, but the largest Australian specimen sent me is only eleven millimetres long, with a diameter of four millimetres. Its spiral angle is about 29°.

Relations and Differences.—I know of only one species at all like this one, and that is my *L. subconstricta.* The ornamentation of both species is very similar, but the last named is much smaller, and its spiral angle is only 25°, while that of the *L. constricta* is 29°.

Horizon and Localities.—I consider *L. constricta* one of the most characteristic species of the Upper Carboniferous Limestone. I have never noticed it in the Middle or Lower Carboniferous Limestone. It is common in the Visé Limestone; it seems rarer in that of Bolland, Yorkshire, near Glasgow, Scotland, and at Cork, Ireland. I have also proved its presence at Bleiburg, in Carinthia. Mr. Clarke found a single specimen in a dark grey limestone on the banks of the Karua.

LOXONEMA ACUTISSIMA, *L. G. de Koninck.*

Pl. XXIII, Fig. 22.

This is a much elongated conical shell, with thirteen or fourteen slightly convex spiral whorls with a shallow linear suture. The surface is ornamented with a large number of fine ribs, scarcely visible to the naked eye, and produced by the successive growths of the shell. The shape of the aperture is unknown to me.

Dimensions.—The length is fourteen millimetres; the transverse diameter of the last whorl, four millimetres; and the spiral angle, 16°.

Relations and Differences.—In general form this shell is very like that figured by Phillips, Pl..16, Fig. 23, of his work on Yorkshire, and which he has taken for a variety of his *Buccinum* (*Loxonema*) *curvilineum,* in spite of the great difference between it and the typical species. At present I would not venture to affirm that it is the same as this one, but I know no other species at all like it.

Horizon and Localities.—This was found with the preceding in the limestone on the banks of the Karua.

LOXONEMA RUGIFERA, *J. Phillips.*[1]

Pl. XXIII, Fig. 21.

Melania rugifera,		J. Phillips, 1836, Geol. Yorkshire, II, p. 229, pl. 16, fig. 26.
Chemnitzia	,,	L. G. de Koninck, 1843, Descr. Anim. Foss. Terr. Carb. Belg., p. 462, pl. 41, fig. 2.
Loxonema	,,	J. Morris, 1843, Cat. Brit. Foss., p. 150.
,,	,,	F. McCoy, 1855, Brit. Pal. Foss., p. 545.
Chemnitzia	,,	E. d'Eichwald, 1860, Lethæa Rossica, I, p. 1116.

This shell is elongated, conical, and composed of fourteen to sixteen convex spiral whorls. Each whorl is ornamented, according to its age, with from twelve to fifteen tubercles, elongated in the direction of the axis of the shell, but slightly oblique to that axis, and occupying the superior three-quarters of the total breadth of each spiral turn; the inferior quarter is depressed and smooth, or simply striated crossways. The whole surface, including the tubercles, is covered with fine irregular arched lines of growth. The aperture is oval, and a little longer than broad; the columella is covered by a thin callosity extending a little in front of the internal margin of the aperture, while the external margin is thin and sharp.

Dimensions.—This species reaches a length of five or six centimetres. The Australian specimen sent me is only thirteen millimetres long, and its spiral angle 19°.

Relations and Differences.—It would be difficult to distinguish this species from my *L. similis* before both had reached the adult stage, as there is not a constant difference in the degree of their spiral angles. Adults of *L. similis* differ by the absence of tubercles on the last whorl; these tubercles are constant on the last whorl of *L. rugifera.*

Horizon and Localities.—This species was first found by J. Phillips in the Upper Carboniferous Limestone of Bolland, Yorkshire; afterwards d'Archiac and de Verneuil found it in that of Valdai, Lake Ilman, and Vitegra; and M. d'Eichwald found it in that of Cosatchi-Datschi. I found it in limestone of the same age at Visé. Mr. W. B. Clarke obtained it from a white limestone at Burragood. I much doubt if the Devonian species described by J. Phillips under the same name is identical with it.

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[1] [Compare R. Etheridge, Junr., Geol. and Pal. Q'land., 1892, p. 285. t. 15, f. 17; Procs. Linn. Soc. N. S. Wales, 1895, IX (2), p. 530. —W.S.D.]

Class—CEPHALOPODA.

Order—TETRABRANCHIATA.

Genus—GONIATITES, *de Haan.*

GONIATITES MICROMPHALUS, *J. Morris.*

Pl. XXIV, Fig. 5.

Bellerophon	***micromphalus,***	J. Morris, 1845, in Strzelecki's Phys. Descr. N. S. Wales and V. D. Land, p. 288, pl. 18, fig. 7.
„	„	F. McCoy, 1847, Ann. Mag. Nat. Hist., XX, p. 308.
„	„	J. D. Dana, 1849, Geol. Wilkes' U. S. Explor. Exped., p. 708 pl. 10, fig. 6.
„	*undulatus,*	*Idem*, 1849, *ibid.*, p. 707, pl. 10, fig. 4.

This shell is discoidal, of moderate size, convex on the sides, with a rounded back. The several whorls of the spire envelope each other almost completely, and leave only a small umbilicus. The specimens being deprived of their shells, their surface ornamentation can be described approximately only; but as the shell was very thin, as in most *Goniatites*, the traces on the casts show that the surface was covered with indistinct lines of growth, interrupted at set distances by transverse depressions, which extend into the dorsal part and there produce a large sinus, the convexity of which is turned backwards, and indicates the shape of the upper margin of the aperture. The aperture is rounded in front, and very much hollowed out behind by the whorl of the spire, which makes it sub-semilunar. I have discovered no traces of septa on these specimens.

Dimensions.—The diameter is twenty-two millimetres, the thickness thirteen, and the height of the aperture six millimetres.

Relations and Differences.—Both Professor Morris, who first described this species, and Mr. Dana remarked that it had much more the appearance of *Goniatites* than of *Bellerophon*, but they placed it with the latter on account of the complete absence of septa. For my part, I am convinced

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[1] [A. H. Foord, Geol. Mag., 1890, VII (3), p. 104; R. Etheridge, Junr., Procs. R. Phys. Soc. Edinb., 1880, V, p. 304; Geol. and Pal. Q'land., 1892, p. 294; *G.* (*Prolecanites ?*) *micromphalus*, R. Etheridge, Junr., Records Geol. Survey N. S. Wales, 1894, IV, p. 36, t. 7, f. 9–14; *Agathiceras* (?) *micromphalum*, A. H. Foord and A. H. Crick, Cat. Foss. Cephal. B. M. Nat. Hist. 1897, III, p. 271.—W.S.D.]

that it belongs to the first of these genera, as I know of no *Bellerophon* in the state of a cast that does not preserve some very appreciable trace of the band of the sinus with which the dorsal part is furnished; but no trace of it is seen on this specimen. But all the specimens show transverse furrows, very wavy on the anticolumellar part of the shell, exactly like those on the surface of many *Goniatites*—see those described and figured by J. Phillips.[1] I am also much inclined to think that *G. micromphalus* is the same as same Author's *G. micronotus.* In any case the difference between these Australian specimens and that figured by the learned Professor of Oxford is so slight that it would be difficult to put it into words. *G.* (*Bellerophon*) *undulata,* Dana, seems to me only a *G. micronphalus* with more pronounced transverse furrows.

Horizon and Localities.—This was found in the Illawarra (Morris), and in the Muree Sandstone, where it is rather common.

GONIATITES STRICTUS, *J. D. Dana.*

Bellerophon strictus, J. D. Dana, 1847, Am. Journ. Sci., IV (2), p. 151.

„ „ *Idem,* 1849, Geol. Wilkes' U. S. Explor. Exped., p. 707, pl. 10, fig. 5.

This is a rather small, discoidal shell, depressed laterally, with a rounded back. All the spiral whorls envelope each other, and produce only a small umbilicus the margins of which are slightly raised and form a broad funnel. The aperture is higher than broad, and deeply hollowed behind by the whorl of the spire. The surface is quite smooth, and I can find no trace of striæ. The septa are unknown.

Dimensions.—The diameter is eleven, and the thickness five, millimetres.

Relations and Differences.—This species differs from the preceding by the absence of all trace of ornamentation, by its less relative width, and by the depression of the lateral parts.

Horizon and Localities.—Dana found this at Wollongong, and Clarke in a black limestone at Harper's Hill.

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[1] Geol. Yorkshire, II, pl. 19, figs. 1, 4, 16, 17, 22, 26, 33, 34.

Genus—ORTHOCERAS, *Breynius.*

ORTHOCERAS STRIATUM, *J. Sowerby.*[1]

Pl. XXIV, Fig. 2.

Orthocera striata, J. Sowerby, 1814, Min. Conch., I, p. 129, pl. 58.

Orthoceras striatum, F. McCoy, 1844, Synop. Carb. Foss. Ireland, p. 8 (non idem, F. McCoy, Brit. Pal. Foss., p. 405).

A very large, straight, conical shell, with very thin longitudinal ribs, partly interrupted and crossed transversely by more or less irregular, rather oblique, and sometimes slightly undulating lines of growth. The septa are concave, and sub-hemispherical, with horizontal margins. The siphuncle is central, rounded, rather funnel-shaped, and having nearly one-tenth of the diameter of the septa. The distance between the septa varies with the progressive growth of the shell, so that the space between the last formed septa is eleven millimetres while that between the middle septa is only nine millimetres. The last chamber is very long and spacious, seventeen centimetres long, with an oblique sharp edge, although its shell may be thicker for the length of two centimetres round the margin than on the rest of the shell.

Dimensions.—As Mr. Clarke sent me an example of this species having an uninterrupted length of thirty-seven centimetres, and having its terminal chamber preserved, it was not difficult to determine the total length of the shell when perfect. Its length would be about seventy-five centimetres, and the apical angle of its lower extremity about two and a half or three degrees, supposing that the lower and missing part of the shell is as regular as the upper part which has served for this description. The diameter of the terminal aperture is about four and a half centimetres.

Relations and Differences.—This beautiful species is easily distinguished from *O. cinctum,* Sowerby, and *O. Morrisianum,* L. G. de Koninck, which have their surfaces ornamented with transverse striæ, by its numerous longitudinal ribs, no traces of which are visible on the species just quoted. My *O. lineale* differs by having no lines of growth. There is also a decided difference in the apical angles of all these species, in the shape of their septa, and also in the position and diameter of the siphuncle. Mr. McCoy has referred to *O. striatum* a Devonian species which Phillips confused with *O. ludense*, which is Silurian, and which besides being longitudinally striated, differs by the oval shape of its transverse section, and the excentric position of its siphuncle.

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[1] [*Actinoceras striatum,* J. Sowerby (?). A. H. Foord, Cat. Foss. Cephal. B. M. Nat. Hist., 1891, II, p. 382. Compare also R. Etheridge, Junr., Geol. and Pal. Q'land., 1892, p. 293, t. 15, f. 1.—W.S.D.]

Horizon and Localities.—This beautiful species was found in 1812 by Wood and Wright, in the black Carboniferous Limestone of Cork, where it seems rather rare. Mr. Clarke found the magnificent specimen I have figured in a brownish micaceous limestone at Wollongong, and some fragments in Russell's Shaft.

ORTHOCERAS MARTINIANUM (?), *L. G. de Koninck.*[1]

Pl. XXIV, Fig. 3.

Orthoceras Martinianum, L. G. de Koninck, 1843, Descr. Anim. Foss. Terr. Carb. Belg., p. 505, pl. 41, fig. 4.

This rather small shell is thin, elongated, decidedly conical, and perfectly smooth outside. Its septa are only slightly vaulted and rather close together. The distance between them equals nearly one-fourth of their diameter. The siphuncle is very small and rather excentric.

Dimensions.—The length of this fragment is twenty-six millimetres, the greater diameter four and a half millimetres, the lesser diameter two and a half millimetres, and the apical angle about ten degrees.

Relations and Differences.—I should without hesitation have placed this specimen with *O. inequiseptum*, Phillips, as it is exactly the same shape, had not the learned English geologist mentioned as one characteristic of *O. inequiseptum* that the septa are very far apart in young individuals; they are rather close together in *O. Martinianum*. It differs from my *O. calamus* by being much shorter, and by its much greater apical angle.

Horizon and Localities.—I found this species in the Upper Carboniferous Limestone at Visé, where it is rare. In Australia it is found in a dark-grey limestone in the Ichthyodorulite Range on the banks of the Karua River.

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[1] [See also R. Etheridge, Junr., Geol. and Pal. Q'land., 1892, p. 293.—W.S.D.]

Genus—CAMEROCERAS, *Conrad.*

CAMEROCERAS PHILLIPSII, *L. G. de Koninck.*[1]

Pl. XXIV, Fig. 1.

Orthoceras laterale, L. G. de Koninck, 1843, Descr. Anim. Foss. Terr. Carb. Belg., p. 508, pl. 43, fig. 2 (non Phillips).

This is an elongated, slightly conical shell, with a perfectly smooth surface. The septa are slightly concave from the side of the aperture, and the distance between them nearly equals one-fourth of their transverse diameter. The siphuncle is very excentric, rather narrow, and placed at a short distance from the margin, in the form of a rosary, a characteristic common to the genus.

Dimensions.—It seems that this species cannot attain a greater length than from fifteen to twenty centimetres. Its apical angle is thirteen degrees.

Relations and Differences.—In 1843 I confused this shell with ***O. laterale***, Phillips (the same as ***O. undulatum***, Sowerby), but it differs from it by the rounded form of its transverse section, by its horizontal septa, and above all by its small size.

Horizon and Localities.—This species is not very uncommon in the Upper Carboniferous Limestone at Visé. Mr. Clarke found a single specimen at Chinaman's Gully, in a blackish-grey limestone, enclosing innumerable fragments of stems of *Crinoidea*, and resembling the Belgian limestone known as "Petit granit." It is associated with ***Spirifer bisulcatus***, ***Chonetes papilionacea***, Phillips, and ***Orthis resupinata***, W. Martin.

Genus—NAUTILUS, *Breynius.*

NAUTILUS SUBSULCATUS, *J. Phillips.*[2]

Pl. XXIV, Fig. 4.

Nautilus subsulcatus,	J. Phillips, 1836, Geol. Yorkshire, II, p. 233, pl. 17, fig. 18, 25.
„ *sulcatulus*,	*Idem*, 1836, *ibid.*, p. 250.

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[1] [See also R. Etheridge, Junr., Geol. and Pal. Q'land., 1892, p. 293.—W.S.D.]

[2] [*Cœlonautilus subsulcatus.* A. H. Foord, Cat. Foss. Cephal. B.M. Nat. Hist., 1892, II, p. 121.—W.S.D.]

Nautilus subsulcatus, var.	J. de Carle Sowerby, 1840, Trans. Geol. Soc. of London, V (2), pl. 40, fig. 7.
,, ,,	Portlock, 1843, Geol. Rept. Londonderry, p. 405.
,, ,,	L. G. de Koninck, 1843, Descr. Anim. Foss. Terr. Carb. Belg., p. 548, pl. 30, fig. 6; pl. 47, fig. 9 and pl. 49, fig. 4.
,, (*Discites*) *subsulcatus,*	F. McCoy, 1844, Synop. Carb. Foss. Ireland, p. 19.
,, *subsulcatus,*	A. d'Orbigny, 1846, Pal. Univ. Coq. et Moll., I, pl. 48, fig. 1–6.
,, ,,	A. d'Orbigny, 1850, Prod. Pal., I, p. 110.
,, (*Discites*) *subsulcatus,*	J. Morris, 1854, Cat. Brit. Foss., p. 309.
,, *subsulcatus ?,*	E. d'Eichwald, 1860, Lethæa Rossica, I, p. 1312, pl. 49, fig. 21.
,, ,,	L. G. de Koninck, 1873, Rech. Anim. Foss., II, p. 110, pl. 4, fig. 10.

The characteristics of the fragment which I have referred to this species are so clear and like those figures representing it that I have no doubt as to its identity. It will be sufficient to compare the figure I have given with fig. 2, pl. 48 of d'Orbigny's "Paléontologie Universelle." The external shape and that of the septa is exactly the same in both cases, but as the specimen is too imperfect to be described, I have been obliged to go for details to the works of the Authors I have cited in my list of synonyms.

Horizon and Localities.—Phillips was the first to describe this species, and to distinguish it from *N. sulcatus,* Sowerby. He found it in the Upper Carboniferous Limestone at Bolland, Yorkshire. Portlock and McCoy recorded it in Ireland. I found it in the Carboniferous Limestone of Visé, and in shale of the same age at Bleiburg, in Carinthia. The Australian specimen was found on the banks of the Karua River. It is rare everywhere.

Class—CRUSTACEA.

Order—OSTRACODA.

Section—ENTOMOSTRACA.

Genus—POLYCOPE, *G. O. Sars.*

POLYCOPE SIMPLEX, *T. R. Jones and J. W. Kirkby.*[1]

Pl. XXIV, Fig. 7.

Cypridinopsis simplex,	T. R. Jones and J. W. Kirkby, 1871, Trans. Geol. Soc. Glasgow, III, Suppl., p. 26.
Polycope ,,	*Idem,* 1874, Mon. Brit. Foss. Bivalved Entomostraca Carb. Form., p. 54, pl. 2, fig. 1, 10, 12, and pl. 5, fig. 1.

The carapace is slightly oval, compressed, sublenticular, and smooth. According to the Authors cited above there is a slight marginal thickening at the ventral side of some valves. The exterior curve of the gibbosity is very variable. Seen sideways the specimens look nearly round, and obliquely truncated in the antero-ventral region, and consequently show a slight anterior prominence. Seen from the posterior side it appears to be narrowly oboval, while seen from the side of the ligament of the valves it shows a pointed narrow oval.

Dimensions.—The transverse diameter of the largest individuals does not exceed three millimetres; the vertical and longitudinal diameters are a little smaller. The thickness varies from one and a half to two millimetres.

Horizon and Localities.—This species does not seem to be rare. It is found in the limestone at Little Island, near Cork; at Carluke and Campsie, in Scotland. More than fifty valves of this species were found in a fragment of the Muree Sandstone, about twenty-five centimetres square. They were associated with a small number of the carapaces of the next species.

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[1] [" It is more than probable that these are the fry of a species of *Aphania*, or even perhaps an *Aviculopecten.*" R. Etheridge, Junr., Mem. Geol. Survey N. S. Wales, Pal. 5, Pt. 2, 1892, p. 123.—W.S.D.

Genus—ENTOMIS, *T. R. Jones.*

ENTOMIS JONESI, *L. G. de Koninck.*

Pl. XXIV, Fig. 6.

The carapace is oval, oblong, and arched from the ventral side. The valves have smooth surfaces, and are divided into two unequal parts by a transverse furrow having its origin at the dorsal margin, and extending for two-thirds of their breadth. No trace of a tubercle is seen on either valve. The thickness is relatively rather great, and reaches nearly half the longitudinal diameter.

Dimensions.—The length is about two millimetres, the breadth and thickness approximately one millimetre.

Relations and Differences.—This small species has great affinity with *E. nitida*, Roemer, but it is nearly twice as long, while its transverse diameter is relatively less than that of the Devonian species. I have dedicated it to that learned Author, so well known by his many works on the Fossil Entomostraca.

Horizon and Localities.—It is found in the Muree Sandstone, associated with the preceding.

Order—TRILOBITA.

Genus—PHILLIPSIA, *J. E. Portlock.*

PHILLIPSIA SEMINIFERA, *J. Phillips.*[2]

Pl. XXIV, Fig. 9.

Asaphus	*seminiferus,*	J. Phillips, 1836, Geol. Yorkshire, II, p. 240, pl. 22, fig. 8–10.
,,	*gemmuliferus,*	Buckland, 1838, Géol. Min. en rapport avec la Théol., II, p. 88, pl. 66, fig. 10.
,,	*seminiferus,*	Milne Edwards, 1838, in Lamarck, Anim. sans Vertèbres, 2nd ed., V, p. 234.
,,	,,	A. Goldfuss, 1843, Neues Jahrb. für Min., p. 562.

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[1] [R. Etheridge, Junr., Mem. Geol. Survey N. S. Walos, Pal. V, Pt. 2, 1892, p. 122.—W.S.D.]

[2] [In all probability this is not Phillips' species at all. A form closely allied to it is described as *Griffithides* (?). R. Etheridge, Junr., Mem. Geol. Survey, N. S. Wales, Pal. V, Pt. 2, 1892, p. 130. See also *P. seminifera*, var. *australasica*, R. Etheridge, Junr., Geol. and Pal. Q'land., 1892, p. 216, t. 7, f. 14.—W.S.D.]

Phillipsia	*Kellii,*	Portlock, 1843, Rept. Geol. Londonderry, p. 307, pl. 11, fig. 1.
,,	*seminifera,*	J. Morris, 1843, Cat. Brit. Foss., p. 76.
,,	*gemmulifera,*	L. G. de Koninck, 1844, Descr. Anim. Foss. Terr. Carb. Belg., p. 603 (non J. Phillips).
,,	*Kellii,*	F. McCoy, 1844, Synop. Carb. Foss. Ireland, p. 162.
,,	*gemmulifera,*	H. Bronn, 1848, Index Pal., p. 958.
,,	,,	F. Roemer, 1851, Lethæa Geogn., p. 595, pl. IX (2), fig. 9 (fig. 10 exclusâ).
,,	*seminifera,*	J. Morris, 1854, Cat. Brit. Foss., 2nd ed., p. 114.
,,	,,	J. D. Dana, 1864, Man. Geol., p. 319, fig. 556.
,,	,,	V. v. Moeller, 1867, Bull. Soc. Imp. Nat. Moscou, p. 159.
,,	*gemmulifera,*	F. Roemer, 1876, Lethæa Geogn., Atlas, pl. 47, fig. 9 (non Phill.).

The head of this species is sub-semi-elliptical; its length is two-thirds the breadth of the base. The glabella, longer than broad, is a little narrower in its anterior part than at the base; its neck furrow is arched and deep; of the lateral grooves the posterior are oblique, and reach the neck furrow, with which it forms an acute angle; the middle and anterior grooves, much less well defined, are nearly perpendicular to the lateral margins of the glabella, and occupy only about one-third of the total breadth of these. The whole surface is covered with small tubercles, quite visible to the naked eye. The cheeks are also ornamented with similar tubercles. The thorax of a related species being composed of nine segments, I conclude that there is the same number in this. Their pleuræ are grooved, and show a series of small tubercles like those ornamenting the surface of the head. The contour of the pygidium is like that of the cephalic shield; it is slightly vaulted crossways; its axis consist of thirteen or fourteen distinct segments, and it ends in a rather blunt point. Each segment shows six small tubercles, arranged so as to produce a vertical series; its lateral rings are more or less oblique, and arched according to their position, and extend as far as the doublure of the crust. The number of the tubercles is very variable, the upper rings having seven or eight, and the lower rings three or four.

Dimensions.—The only specimen I have examined with its cephalic shield preserved, should be about twenty-five millimetres long. The species often reaches double that length.

Relations and Differences.—This species has often been confused with *P. gemmulifera*, J. Phillips. I myself made this mistake in 1844. Since then I have studied numerous specimens of various species, and have thus been able to prove—first, that *P. gemmulifera* does not differ in the least from the species described and figured by Schlotheim, in 1823, under the name *Trilobites Asaphus pustulatus*, and which should be named *Phillipsia pustulata*, as I said more than twenty years ago; secondly, that *P. seminifera* differs from the species just mentioned by the faintness of its granulations, and the greater number of them on the lateral segments of the pygidium, and by the rather more restricted number on the segments of its axis.

Horizon and Localities.—This *Phillipsia* appears to belong exclusively to the Upper Carboniferous Limestone, in which Phillips found it at Bolland, Yorkshire. I have noticed its presence in the Visé Limestone, and Mr. Clarke found it at Colocolo. It is probably the species found by McCoy in the shales of Dunvegan, but which he did not determine, merely observing that it was closely allied to *P. gemmulifera*, Phillips.

Genus—GRIFFITHIDES, *J. E. Portlock.*

GRIFFITHIDES EICHWALDI, *G. Fischer de Waldheim.*[1]

Pl. XXIV, Fig. 8.

Asaphus Eichwaldi,	G. Fischer de Waldheim, 1825, in Eichwald, Geogn. Zool. per Ingriam Balt. Prov., p. 54, pl. 4, fig. 5.
„ „	Holl, 1829, Handb. Petref., p. 176.
„ *granuliferus,*	J. Phillips, 1836, Geol. Yorkshire, II, p. 239, pl. 22, fig. 7.
„ *obsoletus,*	*Idem*, 1836, *ibid.*, p. 239, pl. 22, fig. 3-6.
„ *Eichwaldi,*	G. Fischer de Waldheim, 1837, Oryct. Gouv. Moscou, p. 121, pl. 12, fig. 2.
Gerastos Brongniarti,	A. Goldfuss, 1843, Neues Jahrb. für Min., p. 562.
Phillipsia „	L. G. de Koninck, 1844, Descr. Anim. Foss. Terr. Carb. Belg. p. 597, pl. 53, fig. 7 (non Deslongchamps).
Griffithides granuliferus,	F. McCoy, 1844, Synop. Carb. Foss. Ireland, p. 160.
„ *obsoletus,*	*Idem*, 1844, *ibid.*, p. 161.

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[1] [*? Griffithides Sweeti*, R. Etheridge, Junr., Mem. Geol. Survey N. S. Wales, Pal. 5, Pt. 2, 1892, pp. 124, 25; Procs. Linn. Soc. N. S. Wales, 1895, IX (2), p. 528, t. 39, f. 3.—W.S.D.]

Phillipsia Brongniarti,	H. Bronn, 1848, Index Pal., p. 958.
,, ,,	J. Morris, 1854, Cat. Brit. Foss., 2nd ed., p. 114.
Griffithides Brongniartii,	E. d'Eichwald, 1860, Lethæa Rossica, I, p. 1437, pl. 54, fig. 8 (non Fischer de Waldheim).
,, *obsoletus,*	*Idem*, 1860, *ibid.*, p. 1440.
Phillipsia Eichwaldi,	V. v. Moeller, 1867, Bull. Soc. Imp. Nat. Moscou, p. 187.

The cephalic shield is sub-semicircular, convex, and its genal angles are very little prolonged, not extending beyond the first articulation of the thorax. The glabella is rather thick and ventricose, making a slight projection on the rudimentary border of the frontal margin. The thorax is composed of eight segments; its axis possesses the same breadth as the lateral lobes; all three are convex. The pygidium, about one-third broader than long, is semi-elliptical, and is furnished with a rather wide limb, to which there is a corresponding internal doublure of the same width; its axis is composed of ten segments, the whole of which form an isosceles triangle, the angle at the apex being very acute, but truncated; the rings are simple, the upper one is three millimetres broad, and the lower only one millimetre; the lateral rings, eight in number, are divided into two lengthways, by a small groove, much less pronounced than the grooves separating the rings, and only just perceptible to the naked eye. The whole surface is covered with fine granulations, not always easy to see when the specimens have lost their first freshness, as these Australian specimens have.

Dimensions.—A nearly perfect specimen is twenty-five millimetres long, of which length the cephalic shield occupies seven, and the pygidium eight, its breadth is fourteen millimetres.

Relations and Differences.—According to Möller, who has published a general review of the Carboniferous Trilobites, accompanied by some good observations on certain errors that I shall have an opportunity of treating later on, several authors have confounded *G. Eichwaldi* with species most unlike it. Thus, the Russian Palæontologist to whom it is dedicated, has designated under this name the species which McCoy has described under the name *G. mucronatus*, and which is easily distinguished from it by its caudal appendage. Verneuil and Morris have made the same mistake. I myself have thought with G. Fischer de Waldheim, and some other authors, that *G. Brongniarti* of the Russian Palæontologist was distinct from *G. Eichwaldi*, of which it is simply a variety. It cannot be confounded with *G. globiceps* on account of the small number of rings on the axis of the pygidium, and the division of its lateral rings, which are simple in *G. globiceps.*

Horizon and Localities.—This species has been known since 1825, and was first found in the Upper Carboniferous Limestone of Russia, on the banks of the Serena in the District of Kozel, Province of Kalouga, and at Kosatschy-Datschy in the Oural. Since then it has been found in the same limestone at Bolland, Yorkshire, and at Visé in Belgium. Mr. Clarke found a nearly perfect specimen in a brownish limestone on the Upper Williams River.

Genus—BRACHYMETOPUS, *F. McCoy.*

Brachymetopus Strzeleckii, *F. McCoy.*

Pl. XXIV, Fig. 10.

Brachymetopus Strzeleckii, F. McCoy, 1847, Ann. Mag. Nat. Hist., XX, p. 231, pl. 12, fig. 1.
„ „ V. v. Moeller, 1867, Bull. Soc. Imp. Nat. Moscou, p. 190.

This is a charming little species, the sub-semicircular cephalic shield of which is surrounded by a border relatively broad, terminating on each side in a genal angle which prolongs itself at least half the length of the thorax. This border is ornamented by a simple series of small tubercles which do not exist on the genal angles; it is separated from the rest of the cephalic shield by a semi-circular groove having its origin on each side of the posterior groove of the cheeks, with which it forms a right angle; this passes to the base of the glabella whence it then constitutes the neck furrow. The glabella is simple, suboval, and not very prominent, it occupies only two-thirds of the total length of the cephalic shield; the cheeks are convex; there is a string of small tubercles all round the glabella, a little larger than those ornamenting the rest of the surface; similar tubercles surround the eyes, which are placed towards the middle of the cheeks and are rather prominent. The thorax I do not know. The pygidium has nearly the same sub-semicircular form as the cephalic shield, and it is also surrounded by a border bearing a series of pointed tubercles, corresponding to the marginal extremity of the lateral rings; these, numbering seven, are unequally divided in the middle by a shallow groove; the thickest part shows tubercles a little longer than those surrounding them, and which cover all the surface. The axis of the pygidium is composed, according to McCoy, of seventeen rings, three or four of which are ornamented in the middle with a big tubercle, thus producing a distinct longitudinal series.

Dimensions.—The length of the cephalic shield is two and a half, and the breadth three, millimetres.

Relations and Differences.—So far there are known only four species in this genus, viz., *B. Strzeleckii*, McCoy, *B. McCoyi*, Portlock, *B. discors*, McCoy, and *B. Ouralicus*, de Verneuil. The last differs from the first by its great size, and the style of its ornamentation, but the difference between *B. McCoyi*, *B. discors*, and *B. Strzeleckii*, is not so appreciable. *B. Strzeleckii* differs from the first by the greater relative breadth of its glabella, and from the second by the difference in the arrangement of the granulations covering its pygidium, and in the spinous points of its border.

Horizon and Localities.—McCoy says this species is common in the shales of Dunvegan. Mr. Clarke found some specimens in the limestone at Burragood and Glen William.

Genus—TOMODUS, *L. Agassiz,*

TOMODUS CONVEXUS? *L. Agassiz.*

Pl. XXIV, Fig. 11.

Cochliodus magnus (pars). L. Agassiz, 1838, Rech. Poiss. Foss., III, p. 174.

It is difficult to be certain that this single fragment of a fish's tooth, found among numerous specimens of Carboniferous fossils sent me from Australia, really belongs to the species named. To guide me in my determination I have nothing but the rather curved shape of the tooth, its terminal angle of thirty to thirty-five degrees, and the punctures of its surface, characters which correspond very well with those of specimens from near Glasgow received under this name. I should not have figured this specimen had it not belonged to an order of fishes the presence of which had not been previously noted in the Carboniferous rocks of Australia.

Horizon and Localities.—Mr. Clarke found it in a greyish sandstone near Tilleghary in the Port Stephens District. Other and better specimens should be searched for, so that it can be accurately determined.

GEOLOGICAL EPITOME.

The preceding work comprises a description of one hundred and seventy-six species of Carboniferous fossils, all collected with great care by the Rev. W. B. Clarke in various parts of New South Wales, and most of which have been figured with the greatest possible accuracy.

Of these species there are one hundred and three the existence of which in Australia was previously unknown, fifty-nine are new to science, and there are seventy-four whose existence has been proved in the Carboniferous rocks of Europe.

In the following tables I have marked each species with an asterisk when it occurs in Europe, or in one of the three important regions of Australia, i.e., New South Wales, Tasmania, and Queensland,[1] so that its distribution can be seen at a glance.

No.		N. S. Wales.	Tasmania.	Queensland.	Europe.
1	*Axophyllum Thomsoni*, L. G. de Koninck	*	...	...	...
2	*Lithostrotion irregulare*, J. Phillips	*	...	...	*
3	„ *basaltiforme*, Conybeare and Phillips	*	...	...	*
4	*Cyathophyllum inversum*, L. G. de Koninck	*	...	...	...
5	*Lophophyllum minutum*, L. G. de Koninck	*	...	...	...
6	„ *corniculum*, L. G. de Koninck	*	...	...	...
7	*Amplexus arundinaceus?* W. Lonsdale	*	...	...	...
8	*Zaphrentis Phillipsi*, Milne Edwards and J. Haime	*	...	...	*
9	„ *Gregoryana*, L. G. de Koninck	*	...	...	...
10	„ *cainodon*, L. G. de Koninck	*	...	...	...
11	„ *robusta*, L. G. de Koninck	*	...	...	...
12	*Cyathaxonia minuta*, L. G. de Koninck	*	...	...	...
13	*Cladochonus tenuicollis*, F. McCoy	*	...	...	...
14	*Syringopora reticulata*, A. Goldfuss	*	...	...	*
15	„ *ramulosa?* A. Goldfuss	*	...	...	*
16	*Favosites ovata*, W. Lonsdale	*	*	...	...
17	*Synbathocrinus ogivalis*, L. G. de Koninck	*	...	...	...
18	*Poteriocrinus tenuis?* T. Austin	*	...	...	*
19	„ *radialis?* T. Austin	*	...	...	*
20	*Platycrinus lævis*, Miller	*	...	...	*
21	*Actinocrinus polydactylus*, Miller	*	...	...	*
22	*Tribrachiocrinus Clarkei*, F. McCoy	*	...	...	...
23	*Cyathocrinus Konincki*, W. B. Clarke	*	...	...	...
24	*Palæaster Clarkei*, L. G. de Koninck	*	...	...	...
25	*Penniretepora grandis?* F. McCoy	*	...	...	*
26	*Dendropora Hardyi*, W. B. Clarke	*	...	...	...

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[1] It is very remarkable that the Colony of Victoria has not yet yielded any fossil of the Carboniferous Limestone, though Palæozoic Formations are not wanting there.

No.		N. S. Wales.	Tasmania.	Queensland.	Europe.
27	*Fenestella plebeia*, F. McCoy	*	*	*	*
	„ *fossula*, W. Lonsdale	*	*	*	...
28	„ *propinqua*, L. G. de Koninck	*	...	...	...
29	„ *multiporata*, F. McCoy	*	...	...	*
30	„ *Morrisii*, F. McCoy	*	...	...	*
31	„ *gracilis*, J. D. Dana	*	...	...	...
32	„ *internata*, W. Lonsdale	*	...	...	...
33	*Protoretepora ampla*, W. Lonsdale	*	...	...	...
34	*Retepora ? laxa*, L. G. de Koninck	*	...	...	...
35	*Polypora papillata ?* F. McCoy	*	...	...	*
36	*Productus Cora*, A. d'Orbigny	*	...	*	*
37	„ *magnus*, F. B. Meek and A. H. Worthen	*	...	...	...
38	„ *semireticulatus*, W. Martin	*	...	...	*
39	„ *Flemingii*, J. Sowerby	*	...	*	*
40	„ *undatus*, Defrance	*	...	...	*
41	„ *punctatus*, W. Martin	*	...	...	*
42	„ *fimbriatus*, J. Sowerby	*	...	...	*
43	„ *scabriculus*, W. Martin	*	...	...	*
44	„ *brachythærus*, G. Sowerby	*	*	...	...
45	„ *fragilis*, J. D. Dana	*	...	...	...
46	„ *Clarkei*, R. Etheridge	*	...	*	...
47	„ *aculeatus*, W. Martin	*	...	..	*
48	*Chonetes papilionacea*, J. Phillips	*	...	...	*
49	„ *Laguessiana*, L. G. de Koninck	*	...	*	*
50	*Strophomenes analoga*, J. Phillips	*	...	*	*
51	*Orthotetes crenistria*, J. Phillips	*	...	...	*
52	*Orthis resupinata*, W. Martin	*	...	...	*
53	„ *Michelini*, C. Leveillé	*	...	...	*
54	*Rhynchonella pleurodon*, J. Phillips	*	...	...	*
55	„ *inversa*, L. G. de Koninck	*	...	...	...
56	*Athyris planosulcata*, J. Phillips	*	...	...	*
	„ *ambigua ?* J. Sowerby	*	...	...	*
57	*Spirifer lineatus*, W. Martin	*	...	...	*
	„ „ var. *crebristria*, J. Morris	*	...	...	*
58	„ *glaber*, W. Martin	*	...	...	*
59	„ *Darwinii*, J. Morris	*	...	...	...
60	„ *subradiatus*, G. Sowerby	*	*	*	...
61	„ *oviformis*, F. McCoy	*	...	...	...
62	„ *duodecimcostatus*, F. McCoy	*	...	*	...
63	„ *Strzeleckii*, L. G. de Koninck	*	...	...	...
64	„ *Clarkei*, L. G. de Koninck	*	...	...	...
65	„ *pinguis*, J. Sowerby	*	...	...	*
66	„ *convolutus*, J. Phillips	*	*	*	*
67	„ *vespertilio*, G. Sowerby	*	*	*	...
68	„ *latus*, F. McCoy	*	...	...	...
69	„ *triangularis*, W. Martin	*	...	...	*
70	„ *bisulcatus*, J. Sowerby	*	...	*	*
71	„ *tasmaniensis*, J. Morris	*	*	...	...
72	„ *exsuperans*, L. G. de Koninck	*	...	...	...
73	*Spiriferina cristata*, v. Schlotheim	*	...	...	*
74	„ *insculpta*, J. Phillips	*	...	...	*
75	*Cyrtina septosa*, J. Phillips	*	...	...	*
76	*Terebratula sacculus*, W. Martin	*	...	...	*
	„ var. *cymbæformis*, J. Morris	*	...	...	...

No.		N S. Wales.	Tas-mania.	Queens-land.	Europe.
77	*Scaldia depressa*, L. G. de Koninck	*	...	...	...
78	„ *lamellifera*, L. G. de Koninck	*	...	...	...
79	*Sanguinolites undatus*, J. D. Dana	*	...	...	...
80	„ *Mitchelli*, L. G. de Koninck	*	...	...	...
81	„ *Etheridgei*, L. G. de Koninck	*	...	...	...
82	„ *McCoyi*, L. G. de Koninck	*	...	...	...
83	„ *curvatus*, J. Morris	*	...	...	...
84	„ *Tenisoni*, L. G. de Koninck	*	...	...	...
85	*Clarkia myiformis*, L. G. de Koninck	*	...	...	...
86	*Cardiomorpha gryphoides*, L. G. de Koninck	*	...	...	...
87	„ *striatella*, L. G. de Koninck	*	...	...	*
88	*Edmondia ? striato-costata*, F. McCoy	*	...	...	...
89	„ *nobilissima*, L. G. de Koninck	*	...	...	...
90	„ *intermedia*, L. G. de Koninck	*	...	...	...
91	*Cardinia exilis*, F. McCoy	*	...	...	...
92	*Pachydomus globosus*, J. D. Sowerby	*	...	...	...
93	„ *lævis*, J. D. Sowerby	*	...	...	...
94	„ *gigas*, F. McCoy	*	...	...	...
95	„ *ovalis*, F. McCoy	*	...	...	...
96	„ *cyprina*, J. D. Dana	*	...	...	...
97	„ *pusillus*, F. McCoy	*	...	...	...
98	„ *politus*, J. D. Dana	*	...	...	...
99	„ *Danai*, L. G. de Koninck	*	...	...	...
100	*Mæonia Konincki*, W. B. Clarke	*	...	...	...
101	„ *elongata*, J. D. Dana	*	...	...	...
102	„ *gracilis*, J. D. Dana	*	...	...	...
103	*Pleurophorus Morrisii*, L. G. de Koninck	*	...	...	...
	Orthonota (?) costata, J. Morris	*	...	...	...
104	*Pleurophorus biplex*, L. G. de Koninck	*	...	...	...
105	„ *carinatus*, J. Morris	*	...	...	...
106	*Conocardium australe ?*, F. McCoy	*	...	...	...
107	*Tellinomya Darwini*, L. G. de Koninck	*	...	...	...
108	*Palæarca costellata*, F. McCoy	*	...	...	*
109	„ *interrupta*, L. G. de Koninck	*	...	...	...
110	„ *subarguta*, L. G. de Koninck	*	...	...	...
111	*Mytilus crassiventer*, L. G. de Koninck	*	...	...	...
112	„ *Bigsbyi*, L. G. de Koninck	*	...	...	...
113	*Aviculopecten leniusculus*, J. D. Dana	*	...	...	...
114	„ *subquinquelineatus*, F. McCoy	*	...	...	...
115	„ *limæformis*, J. Morris	*	*	...	...
116	„ *consimilis*, F. McCoy	*	...	...	*
117	„ *depilis*, F. McCoy	*	...	...	*
118	„ *elongatus*, F. McCoy	*	...	...	*
119	„ *ptychotis*, F. McCoy	*	...	...	*
120	„ *Knockonniensis*, F. McCoy	*	...	...	*
121	„ *Hardyi*, L. G. de Koninck	*	...	...	*
122	„ *cingendus*, F. McCoy	*	...	...	*
123	„ *granosus*, J. Sowerby	*	...	...	*
124	„ *Forbesi*, F. McCoy	*	...	...	*
125	„ *tessellatus*, J. Phillips	*	...	...	*
126	„ *profondus*, L. G. de Koninck	*	...	...	...
127	„ *Fittoni*, J. Morris	*	*	...	...
128	„ *illawarensis*, F. McCoy	*	...	...	...
129	*Aphanaia Mitchellii*, F. McCoy	*	...	...	...

No.		N. S. Wales.	Tasmania.	Queensland.	Europe.
130	*Aphanaia gigantea*, L. G. de Koninck	*	...	...	...
131	*Pterinea macroptera*, J. Morris	*	...	...	...
132	„ *lata*, F. McCoy	*	...	...	*
133	*Avicula sublunulata*, L. G. de Koninck	*	...	...	...
134	„ *Hardyi*, L. G. de Koninck	*	...	...	...
135	„ *decipiens*, L. G. de Koninck	*	...	...	...
136	„ *intumescens*, L. G. de Koninck	*	...	...	...
137	*Conularia tenuistriata*, F. McCoy	*	...	...	...
138	„ *quadrisulcata*, Miller	*	...	...	*
139	„ *lævigata*, J. Morris	*	...	...	...
140	„ *inornata*, J. D. Dana	*	...	...	...
141	*Dentalium cornu*, L. G. de Koninck	*	...	...	...
142	*Platyceras angustum*, J. Phillips	*	...	...	*
143	„ *trilobus*, J. Phillips	*	...	...	*
144	„ *altum*, J. D. Dana	*	...	...	...
145	„ *tenella*, J. D. Dana	*	...	...	...
146	*Porcellia Woodwardii*, W. Martin	*	...	...	*
147	*Pleurotomaria Morrisiana*, F. McCoy	*	...	...	...
148	„ *subcancellata*, J. Morris	*	...	...	...
149	„ *striata*, J. Sowerby	*	...	...	*
150	„ *gemmulifera*, J. Phillips	*	...	...	*
151	„ *humilis*, L. G. de Koninck	*	...	...	*
152	„ *naticoides*, L. G. de Koninck	*	...	...	*
153	„ *helicinæformis*, L. G. de Koninck	*	...	...	...
154	*Murchisonia trifilata*, J. D. Dana	*	...	...	...
155	„ *verneuiliana*, L. G. de Koninck	*	...	*	*
156	*Euomphalus oculus*, J. D. Sowerby	*	...	...	...
157	„ *minimus*, F. McCoy	*	...	...	...
158	„ *catillus*, W. Martin	*	...	...	*
159	*Macrocheilus filosus*, J. D. Sowerby	*	...	...	...
160	„ *acutus*, J. Sowerby	*	...	...	*
161	*Loxonema difficilis*, L. G. de Koninck	*	...	...	...
162	„ *constricta*, W. Martin	*	...	...	*
163	„ *acutissima*, L. G. de Koninck	*	...	...	...
164	„ *rugifera*, J. Phillips	*	...	...	*
165	*Goniatites micromphalus*, J. Morris	*	...	...	...
166	„ *strictus*, J. D. Dana	*	...	...	...
167	*Orthoceras striatum*, J, Sowerby	*	...	...	*
168	„ *Martinianum*, L. G. de Koninck	*	...	...	*
169	*Cameroceras Phillipsii*, L. G. de Koninck	*	...	...	*
170	*Nautilus subsulcatus*, J. Phillips	*	...	...	*
171	*Polycope simplex*, T. R. Jones and J. W. Kirkby	*	...	...	*
172	*Entomis Jonesii*, L. G. de Koninck	*	...	...	...
173	*Phillipsia seminifera*, J. Phillips	*	...	...	*
174	*Griffithides Eichwaldi*, G. Fischer de Waldheim	*	...	*	*
175	*Brachymetopus Strzeleckii*, F. McCoy	*	...	...	...
176	*Tomodus convexus ?*, L. Agassiz	*	...	...	*
	TOTAL	176	9	12	74

By adding the following species to the preceding list a total of 249 is realised. These species now following were not among the fossils sent me by the Rev. W. B. Clarke, but have been described by the Authors whose works I have quoted in this book.

No.		N. S. Wales.	Tasmania.	Queensland.	Europe.
1	*Favosites* (*Stenopora*) *crinitus*, W. Lonsdale	*	...	...	...
2	„ „ *tasmaniensis*, W. Lonsdale	*	*	...	...
3	„ „ *informis*, W. Lonsdale	*	...	...	...
4	*Strombodes ? australis*, F. McCoy	*	...	...	...
5	*Turbinolopsis ? bina ?* W. Lonsdale	*	...	...	...
6	*Ceriopora ? laxa*, R. Etheridge	...	...	*	...
7	*Fenestella undulata*, J. Phillips	*	...	...	*
8	„ *media*, J. D. Dana	*	...	...	...
9	*Glauconome pluma ?* J. Phillips	*	...	...	*
10	*Hemitrypa sexangula*, W. Lonsdale	*	...	...	*
11	*Lingula ovata*, J. D. Dana	*	...	...	...
12	*Discina affinis*, F. McCoy	*	...	...	...
13	*Siphonotreta ?? curta*, J. D. Dana	*	...	...	...
14	*Productus rugatus ?* J. Phillips	*	...	...	*
15	„ *subquadratus*, J. Morris	*	*	...	...
16	*Spirifer Stokesii*, Koenig	...	*	...	...
17	„ *paucicostatus*, G. B. Sowerby	*	...	...	...
18	*Sanguinolites glendonensis*, J. D. Dana	*	...	...	...
19	„ *audax*, J. D. Dana	*	...	*	...
20	*Edmondia ? concentrica*, R. Etheridge	...	...	*	...
21	„ *obovata*, R. Etheridge	...	...	*	...
22	*Solecurtus ? ellipticus*, J. D. Dana	*	...	...	...
23	„ *planulatus*, J. D. Dana	*	...	...	...
24	*Astarte ? gemma*, J. D. Dana	*	...	...	...
25	*Pachydomus* (*Astartila*) *cytherea*, J. D. Dana	*	...	...	...
26	„ „ *politus*, J. D. Dana	*	...	...	...
27	„ „ *cyclas*, J. D. Dana	*	...	...	...
28	„ „ *transversus*, J. D. Dana	*	...	...	...
29	*Pachydomus ?* „ *corpulentus*, J. D. Dana	*	...	...	...
30	*Pachydomus* „ *intrepidus*, J. D. Dana	*	...	...	...
31	„ „ *lineatus*, J. D. Sowerby	*	...	...	...
32	„ „ *antiquatus*, J. D. Sowerby	*	...	...	...
33	„ „ *sacculus*, F. McCoy	*	...	...	...
34	„ „ *lævis*, J. D. Sowerby	*	...	...	...
35	*Cardinia ? recta*, J. D. Dana	*	...	...	...
36	*Eurydesma cordata*, J. Morris	*	...	...	...
37	*Eurydesma ? elliptica*, J. D. Dana	*	...	...	...
38	„ *globosa*, J. D. Dana	*	...	...	...
39	*Cypricardia ? acutifrons*, J. D. Dana	*	...	...	...
40	„ *imbricata*, J. D. Dana	*	...	...	...
41	„ *arcodes*, J. D. Dana	*	...	...	...
42	„ *prærupta*, J. D. Dana	*	...	...	...
43	„ *siliqua*, J. D. Dana	*	...	...	...
44	„ *simplex*, J. D. Dana	*	...	...	...
45	*Cypricardia* (*Avicula ?*) *veneris*, J. D. Dana	*	...	...	...
46	*Venus ? gregaria*, J. D. Dana	*	...	...	...

(1) I must note that I cannot guarantee the accuracy of these species, as several of them appear very doubtful.

No.		N. S. Wales.	Tasmania.	Queensland.	Europe.
47	*Notomya ? securiformis*, F. McCoy	*	...	...	...
48	*Notomya ? clavata*, F. McCoy	*	...	...	...
49	*Orthonota ? compressa*, J. Morris	...	*	...	...
50	*Orthonota ? costata*, J. Morris	*	...	...	...
51	*Mæonia valida*, J. D. Dana	*	...	...	...
52	„ *axinia*, J. D. Dana	*	...	...	...
53	*Mæonia ? carinata*, J. D. Dana	*	...	...	...
54	*Mæonia fragilis*, J. D. Dana	*	...	...	...
55	„ *rugiformis*, J. D. Dana	*	...	...	...
56	„ *elliptica*, J. D. Dana	*	...	...	...
57	„ *grandis*, J. D. Dana	*	...	...	...
58	*Mæonia ? recta*, J. D. Dana	*	...	...	...
59	*Tellinomya* (*Nucula*) *abrupta*, J. D. Dana	*	...	...	...
60	„ „ *concinna*, J. D. Dana	*	...	...	...
61	„ „ *glendonensis*, J. D. Dana	*	...	...	...
62	*Pinna ?* (*Cardium*) *ferox*, J. D. Dana	*	...	...	...
63	*Modiola crassissima*, F. McCoy	*	...	...	...
64	*Aviculopecten squamuliferus*, J. Morris	...	*	...	...
65	„ *comptus*, J. D. Dana	*	...	...	...
66	„ *tenuicollis*, J. D. Dana	*	...	...	...
67	„ *mitis*, J. D. Dana	*	...	...	...
68	„ *imbricatus*, R. Etheridge	...	...	*	...
69	„ (*Streptorynchus*) *Davidsoni*, R. Etheridge	...	...	*	...
70	*Avicula Volgensis ?* E. de Verneuil	*	...	...	*
71	*Theca lanceolata*, J. Morris	*	...	...	...
72	*Conularia ? torta*, F. McCoy	*	...	...	...
73	*Pleurotomaria nuda*, J. D. Dana	*	...	...	...
74	„ *Strzeleckiana*, J. Morris	*	...	...	...
75	„ *carinata*, J. Sowerby	...	...	*	*
76	*Bellerophon decussatus*, Fleming	*	...	...	*
77	*Euomphalus depressus*, J. D. Dana	*	...	...	...
78	„ (*Platyschisma*) *rotundatus*, J. Morris	*	...	...	...
79	*Naticopsis ? harpæformis*, R. Etheridge	...	...	*	...
80	*Bairdia affinis*, J. Morris	*	...	...	...
81	„ *curta*, F. McCoy	*	...	...	...
82	*Cythere impressa*, F. McCoy	*	...	...	...
83	*Urosthenes australis*, J. D. Dana	*	...	...	...
	Total	73	5	8	7
	Number of those in the preceding list	176	9	12	74
	GRAND TOTAL	249	14	20	18

Of these, one hundred and one, or two-fifths to a small fraction, are found exclusively in New South Wales, and as yet are represented in no other country. It is remarkable that a few of these species belong to genera unknown in Europe, e.g., *Tribrachiocrinus, Clarkia, Eurydesma, Aphanaia,* and *Urosthenes.*

By a glance at the figures accompanying my work, it will be easily observed that several species have reached an extraordinary development, e.g., *Cyathocrinus Konincki*, W. B. Clarke—*Spirifer glaber*, W. Martin, *S. Darwinii*, J. Morris, some species of *Pachydomus* and *Mæonia, Aphanaia gigantea*, L. G. de Koninck, *Aviculopecten illawarensis* and *A. limæformis*, J. Morris, and *Conularia inornata*, J. D. Dana.

One would be tempted to believe that these species had been subjected to special influences favourable to their growth, were it not for the fact that, side by side with them, are found others not reaching half the size they generally attain in Europe, e.g., *Loxonema constricta*, W. Martin—*Macrocheilus acutus*, Sowerby, and most of the Gasteropods.

In order to deduce, from the collection of species described, the stratification of the formations which have furnished them, I have had to limit myself to the use of the eighty-one European species represented among them, and to study the beds in which they were found. This examination has proved to me that twenty-two of these species are common to the upper, middle, and lower beds of the Carboniferous Limestone, thirty-six belong exclusively to the upper beds, five or six to the upper and middle beds, and six or seven to the lower beds. It must be observed that while the thirty-six species of the upper beds contain a small number of characteristic species, such as *Lithostrotion basaltiforme* and *L. irregulare, Productus fimbriatus, P. punctatus*, and *P. undatus, Chonetes papilionacea, Spirifer bisulcatus, Pleurotomaria gemmulifera* and *P. carinata, Euomphalus catillus, Loxonema constricta*, etc., the middle and lower beds furnish no decidedly characteristic species; such are for the first—*Spirifer striatus* and *Syringothyris cuspidatus*, and for the second *Athyris Royssii, Spirifer mosquensis* and *S. laminosus, Conocardium Hibernicum* and *Nautilus Konincki*, which are absent. I believe then that I am right in concluding that most of the Carboniferous rocks of New South Wales belong to the upper beds; that a part, chiefly those containing *Spirifer pinguis* and *S. convolutus*, var. *rotundatus*, may be assigned to the middle beds and that if the lower beds are represented at all, it is only by some insignificant spots where fossils are rare. I will leave to others the biological deductions which can be drawn from the study of the Carboniferous Fauna just described, as compared with that of other countries.

I will confine myself to remarking that it is probable that the sea in which the Carboniferous animals of Australia were developed, was in communication with that in which lived the animals of the same epoch found in Belgium, about Visé and Namur; in Yorkshire, England; near Glasgow, Scotland, near Cork and Dublin, Ireland; and Silesia, Germany. This sea was still in existence at the time when the greater part of the Carboniferous rocks of America and Russia, as well as those of the North of Ireland, and of the neighbourhood of Tournai, of Feluy, of Soignies, and of Comblain-au-pont of our country, had already emerged, and when the Fauna which they enclose had been for the greater part destroyed.

STRATIGRAPHICAL NOTE.

In this, the Third Part of his Researches on the Palæozoic Fossils of New South Wales, De Koninck treats of what he terms the "Carboniferous Fossils." (*Vide* pp. 108 and 282.) In this wide use of the term Carboniferous, so as to include all the horizons to which the fossils described in this work belong, De Koninck followed the classification adopted by most Australian Geologists at the time he wrote. Later observations, however, by Mr. R. L. Jack and Mr. R. Etheridge, Junr., have led them to adopt the term Permo-Carboniferous to embrace such horizons in Queensland as those covered by the term Carboniferous of De Koninck, as applied to the rocks of New South Wales.[1] Five distinct formations are included by these authors under this term, namely—the Gympie and Star Formations, and the Lower, Middle, and Upper Divisions of the Bowen River Coal-field.

These five formations have been grouped together in one system, chiefly on account of the identity of certain marine fossils occurring in them, which range from the Gympie to the Middle Bowen Divisions inclusive, notably such varieties as *Protoretepora ampla*, Lonsd.; *Spirifera vespertilio*, G. B. Sby.; *Spirifera Strzeleckii*, De Kon.; *Martinia* (*Martiniopsis ?*) *subradiata*, G. B. Sby.; *Productus brachythærus*, G. B. Sby.; *Conularia tenuistriata*, McCoy; etc. The Upper Bowen is linked with the Middle Bowen Division by the community of its flora, as well as by the close relationship of its marine fauna. The exact Stratigraphical relations of the Star and Gympie formations to one another are not known, but it is inferred that the Gympie is probably the older, on account of its being usually more highly inclined and more metamorphosed than the Star Division, as developed in Queensland. The Lower Bowen Division, which is chiefly volcanic, has not been observed in Queensland in contact with either Star or Gympie beds, but appears to be succeeded by the Middle Bowen Division, without any marked unconformity.

Recent observations have shown that probably the Gympie Division, as well as the equivalents of the Middle and Upper Bowen Divisions of Queensland, are extensively developed in New South Wales. Possibly the Star Division may also be represented in New South Wales by such formations as the friable quartzites with *Rhynchonella pleurodon*, of the Clyde

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[1] Geology and Palæontology of Queensland and New Guinea. By R. L. Jack, F.G.S., F.R.G.S., and R. Etheridge, Junr., pp. 70, 71. By Authority. Brisbane, 1892.

Mountains, near Braidwood. The Stroud Series of New South Wales, with its associated volcanic rocks, may be homotoxial with the Lower Bowen Division in part, and in part with the Star Formation. An attempt has been made by me, elsewhere, to summarise present ideas as to the relations to one another of some of these divisions in New South Wales.[1]

It is clear that, as shown above,[2] there is an immense unconformity between the Coal-measures (Upper or Middle Bowen) of Fraser's Creek Station, near Ashford, New South Wales, and the Gympie rocks in the same neighbourhood. This unconformity has been figured and described in more detail by Mr. E. F. Pittman, Assoc. R.S.M., the Government Geologist of New South Wales.[3]

These sections make it clear that, inasmuch as the bedding planes of the Middle or Upper Bowen Coal-measures are at right angles to those of the Gympie there is a vast unconformity at that locality between these two formations. As it is probable that some of the localities, from which the fossils described in this work by De Koninck were derived, are situated in the Gympie Formation, it obviously is now of importance to separate the Gympie localities, if possible, from the Middle and Upper Bowen. Sufficient evidence, however, has not as yet been obtained in New South Wales to prove whether certain of these localities belong to the Gympie or to the Star Formations.

Hitherto no marked unconformity has been observed between the Star (?) formation on the one hand and the Middle or Upper Bowen Formation, in New South Wales, on the other.

While the extreme divisions of the so-called Permo-Carboniferous System (*i.e.*, the Gympie and the Upper or Middle Bowen Formations) are strongly unconformable to one another, unconformity has not yet been observed between its middle members. Mr. R. Etheridge, Junr.,[4] has shown that there is nevertheless sufficient palæontological evidence to justify the separation of these formations in New South Wales into two distinct groups.

The older group is characterised by such forms in its marine fauna as *Productus semireticulatus*, Martin, occasional Trilobites, such as those herein described by De Koninck as *Phillipsia seminifera*, J. Phillips, *Griffithides*

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[1] Procs. Linn. Soc. N. S. Wales, 1893, VIII (2), pp. 584-594, Pl. xxviii.
[2] *Op. cit.*, p. 587, pl. 28.
[3] Records Geol. Survey N. S. Wales, 1896, V, Pt. 1, pp. 26-30, Pls. 3, 4.
[4] Mem. Geol. Survey N. S. Wales, Pal. V, Pt. 1, 1891, pp. 3, 4.

Eichwaldi, G. Fischer de Waldheim, and *Brachymetopus Strzeleckii*, F. McCoy, and in its flora by several varieties of *Lepidodendron*, *L. australe*, McCoy, predominating in the lower beds, and *L. Veltheimianum*, Sternberg, and *L. Volkmannianum*, Sternberg, in the upper beds of this older group. *Rhacopteris* is also present in great abundance in New South Wales in association with the two last varieties of *Lepidodendron*. In the newer group the flora is characterised by the abundance of *Glossopteris*, *Vertebraria*, and *Gangamopteris*, to the entire exclusion of *Lepidodendron* and *Rhacopteris*, and its marine fauna is remarkable for the abundance of certain forms not met with in the older group such as *Goniatites micromphalus*, Morris, *Strophalosia Clarkei*, Eth., *Dielasma sacculus*, Martin, var., *Spirifera convoluta*, Phill., *Merismopteria macroptera*, Morris, *Mæonia carinata*, Morris.

At present New South Wales geologists follow the classification adopted by Mr. R. Etheridge, Junr., for the rocks ranging from Gympie to Upper Bowen in New South Wales, and to the older group (the *Lepidodendron* group, with interbedded marine strata) they apply the term Carboniferous, and restrict the term Permo-Carboniferous to the newer group, the *Glossopteris* group, with its associated marine strata.

The lithological character of the rocks forming these respective groups is also in favour of their separation, implying, as it does, a probable considerable change of climatic conditions, at about the time of the disappearance of *Lepidodendron*, and the first appearance of *Glossopteris* and *Gangamopteris* in Eastern Australia. Conclusive evidence as to the presence of ice in Southern India, Southern Africa, and Australia in Permo-Carboniferous or Permian time, has been adduced by many observers, too numerous to admit of being referred to in this brief note. Elsewhere the attempt has been made by me to summarise the evidence so far as relates to Australia.[1]

Reference may nevertheless be made to the comments by Dr. Feistmantel[2] and Prof. Dr. W. Waagen.

Dr. Feistmantel correlates the Bacchus Marsh Beds of Victoria, and the Upper and Lower Marine Beds of New South Wales (= Middle Bowen Beds) with the Dwyka Conglomerates of South Africa and the Talchir Boulder Beds of India.

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[1] Rept. Austr. Assoc. Adv. Science, 1895, VI, pp. 58-98. Quart. Journ. Geol. Soc., 1896, LII, pp. 289-301, Pl. XII.

[2] The Geological and Palæontological relations of the Coal and Plant-bearing Beds of Palæozoic and Mesozoic Age in Eastern Australia and Tasmania. Mem. Geol. Survey N. S. Wales, Pal. 3, 1890.

He states (*op. cit.*, p. 181)—"The most important phenomenon within these various deposits is the conglomerates or boulder beds, about the origin of which there is now the general opinion that they have been deposited through the action of ice in one form or other, the manner of deposition being such as to force upon one this kind of explanation; and besides this, there have been found polished and ice-scratched pebbles within these beds. This circumstance would, of course, indicate a rather general change of climatic conditions over Australia, portions of Africa, India, etc., towards the close of the Carboniferous epoch."

Dr. Waagen[1] states that it is possible that the great revolution which took place in the fauna of the sea at the end of the Palæozoic Period was brought about, directly or indirectly, by the great depression of temperature which made itself felt over the whole earth, "with the exception of South America," towards the end of Palæozoic time. The boulder beds discovered by Professor Derby, in Southern Brazil, show now that probably even South America did not escape glacial action in Permo-Carboniferous time.

Without attempting to discuss the large question as to whether or not this evidence of ice-action was world-wide in Permo-Carboniferous or Permian time, it may be stated that the occurrence of numerous and large erratics in the Upper and Lower Marine Beds (Middle Bowen) of the New South Wales Permo-Carboniferous System justify the assumption that floating ice was present over a large area of Australia during the deposition of the Marine Permo-Carboniferous Beds of New South Wales. It must at the same time be conceded that hitherto, in my opinion, no undoubted glacially-marked pebbles have been found in the Marine Permo-Carboniferous Strata of New South Wales. In Victoria, however, in rocks presumably homotaxial, if not synchronous, strongly-glaciated pebbles are extremely numerous.

It is desirable, therefore, on climatological, as well as on stratigraphical and palæontological grounds, to separate the Carboniferous System proper of New South Wales with *Lepidodendron*, from the Permo-Carboniferous System with *Glossopteris* and *Gangamopteris*. A list is therefore appended of those localities in New South Wales referred to in this work by De Koninck, which are now considered to be Carboniferous, as distinct from Permo-Carboniferous.

T. W. EDGEWORTH DAVID.

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[1] Die Carbone Eiszeit, Jahrb. K. K. Geol. Reichanstalt, 1887, XXXVII, Heft. 2, p. 192.

Carboniferous Localities.

Barraba.
Booral.
Buchan, Gloucester River.
Burragood, Paterson River.
Cedar Brush, Tilleghary.
Colo Colo.
Chinaman's Gully.
Coyeo, Page River.
Dungog.
Dunvegan.
Glen William.
Ichthyodorulite Range, Karua River.
Lewin Brook ("Lewis" and Lewin's").
Pallal.
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[NOTE.—The nomenclature in the plate explanations is retained as in the original Work. Recent changes the Reader will find in the form of footnotes throughout the text.—W.S.D.]

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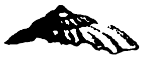
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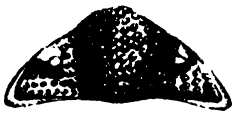
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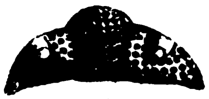
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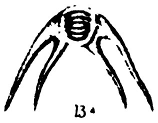
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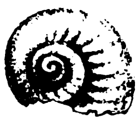
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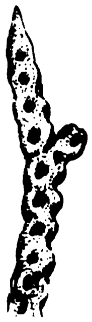
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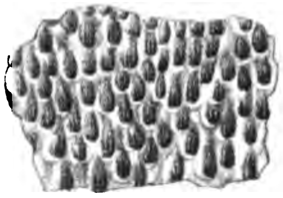
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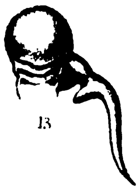
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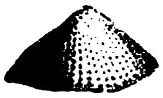
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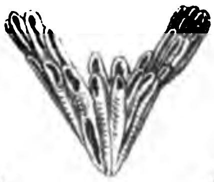
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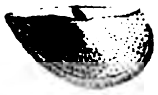
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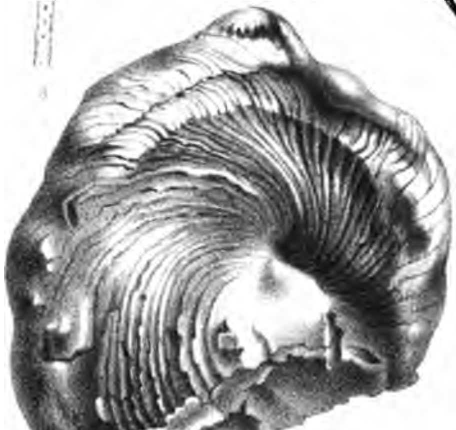
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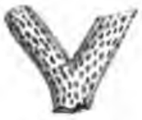
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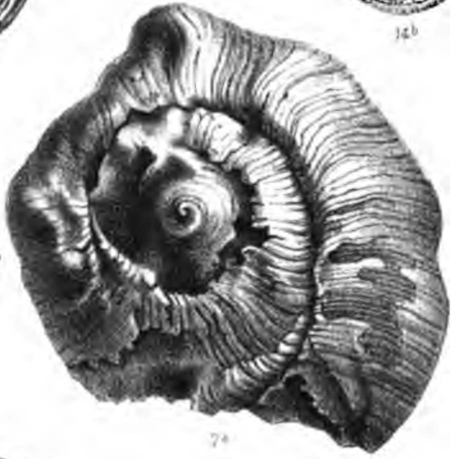
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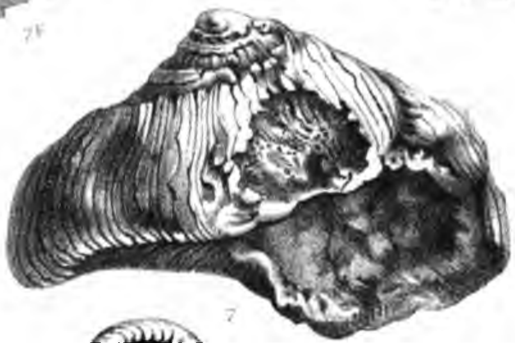
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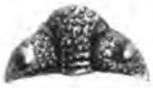
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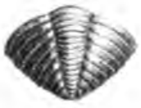
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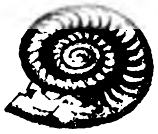
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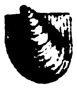
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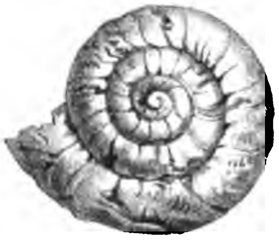
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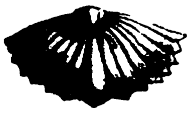
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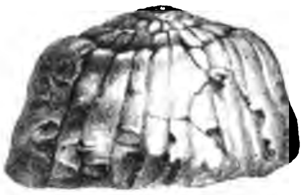
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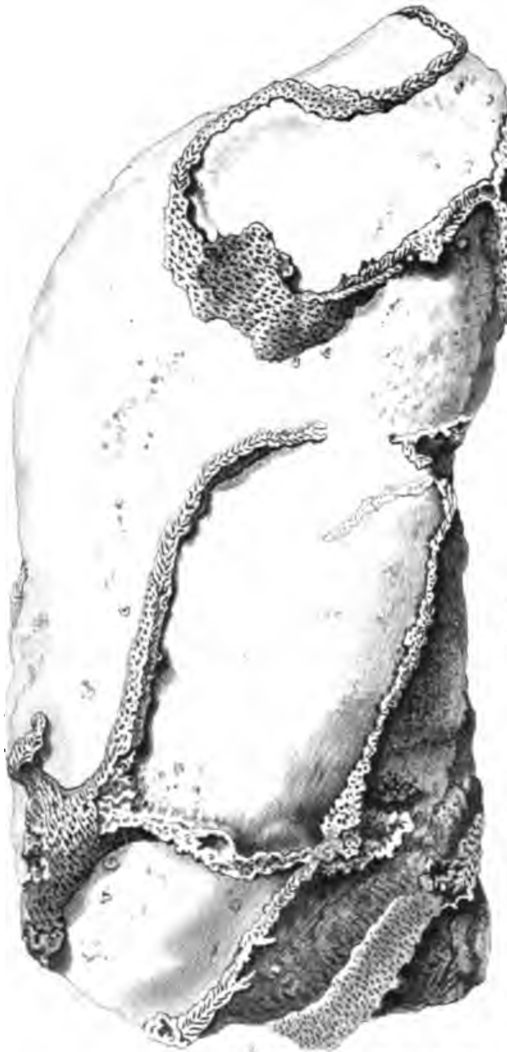

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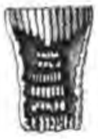

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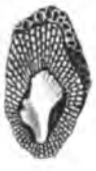

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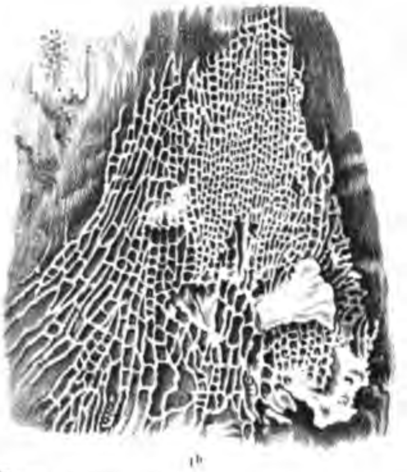

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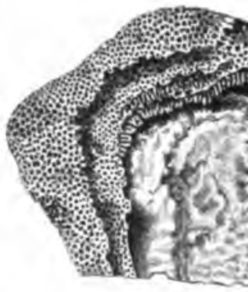

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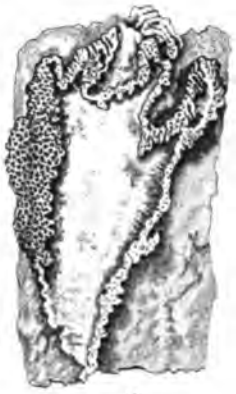

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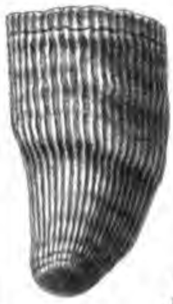

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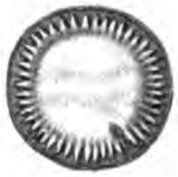

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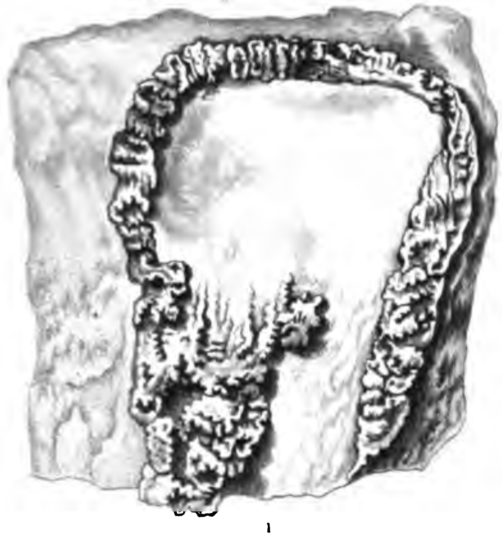

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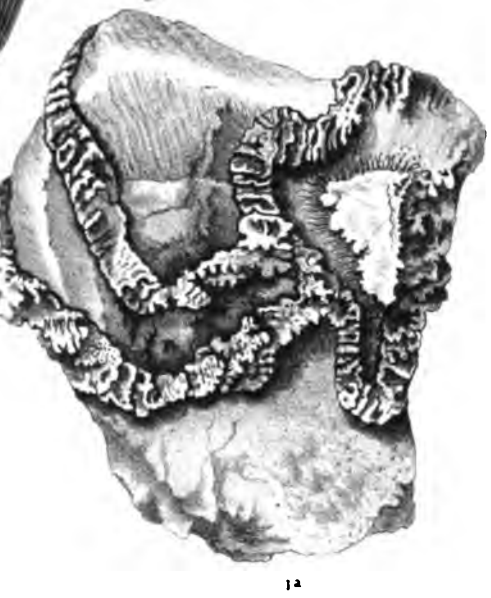

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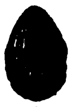
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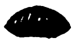
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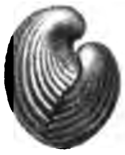
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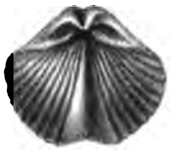
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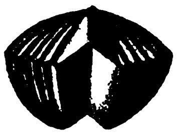
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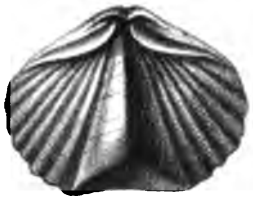
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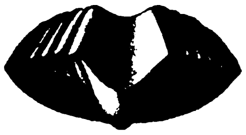
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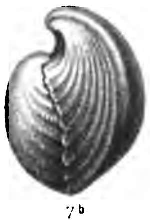
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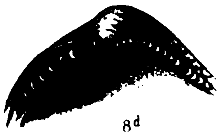
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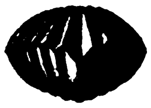
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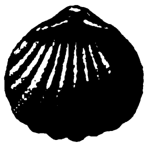
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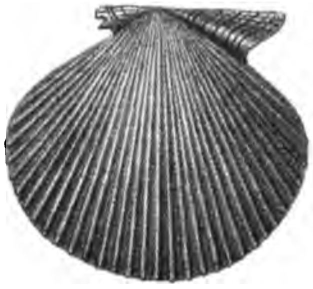
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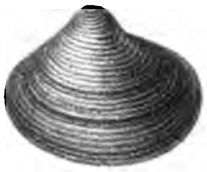
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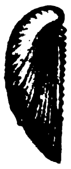
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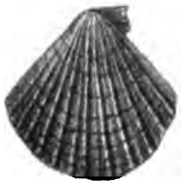
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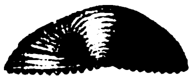
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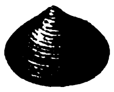
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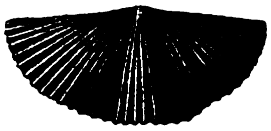
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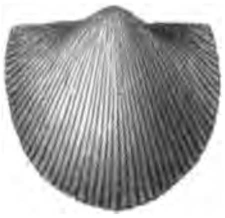
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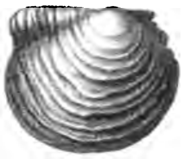
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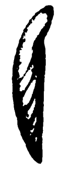
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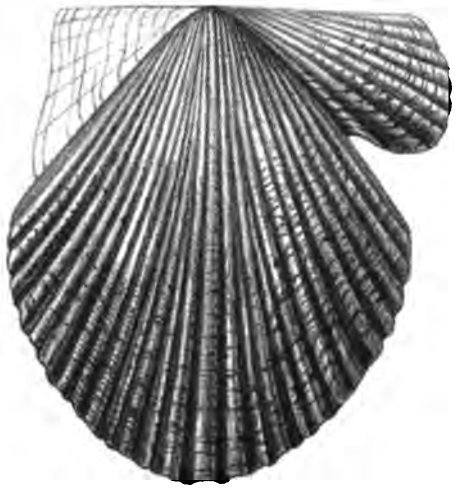
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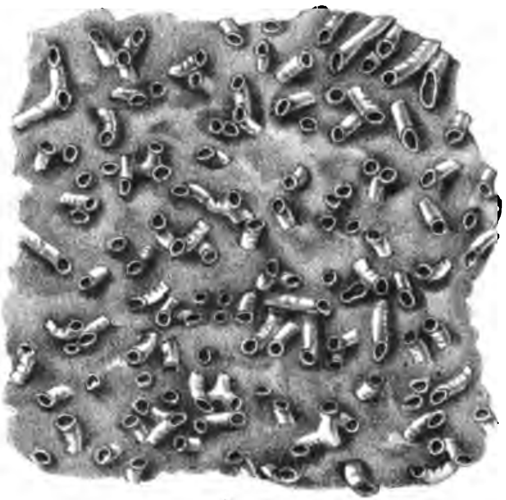
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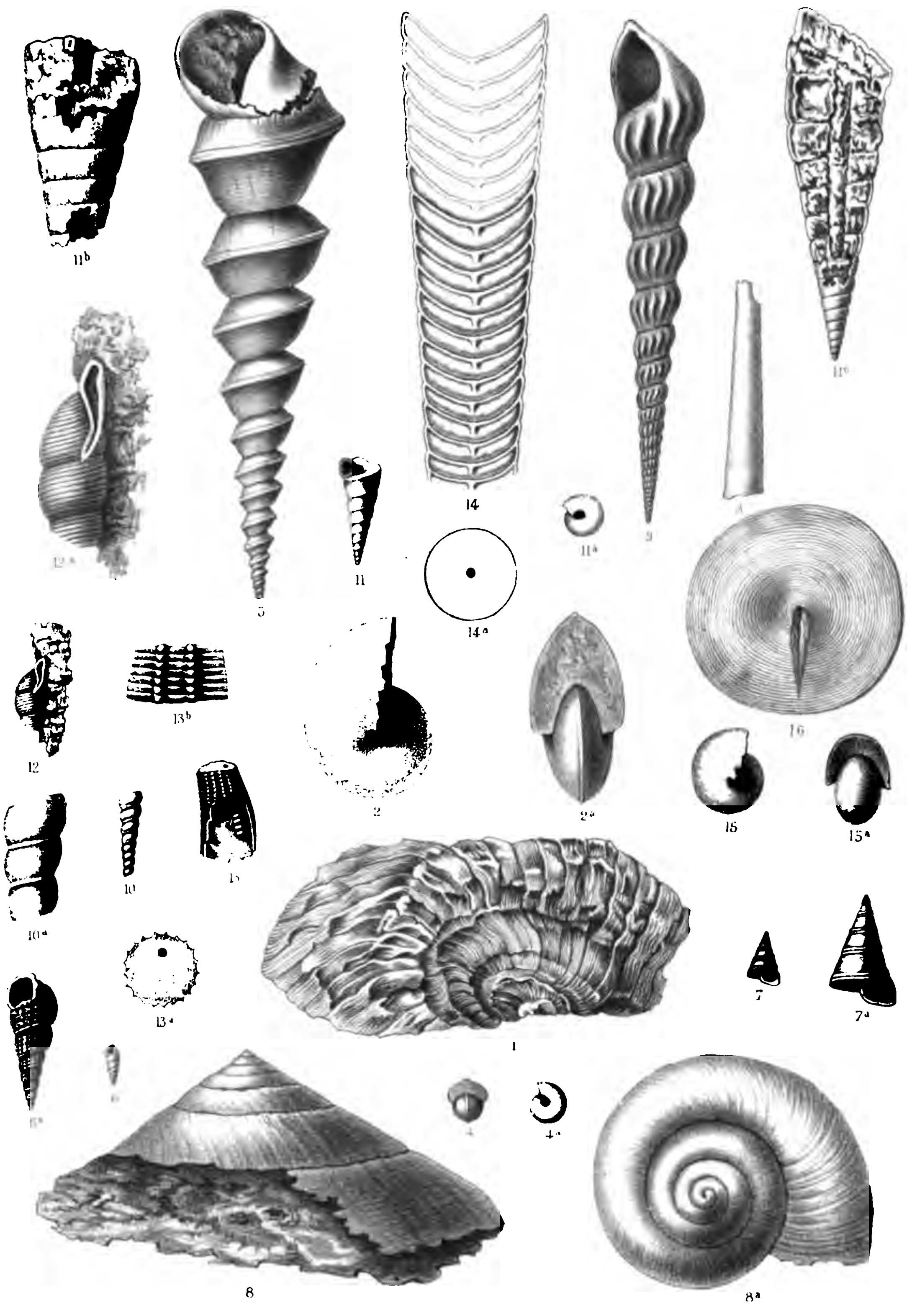

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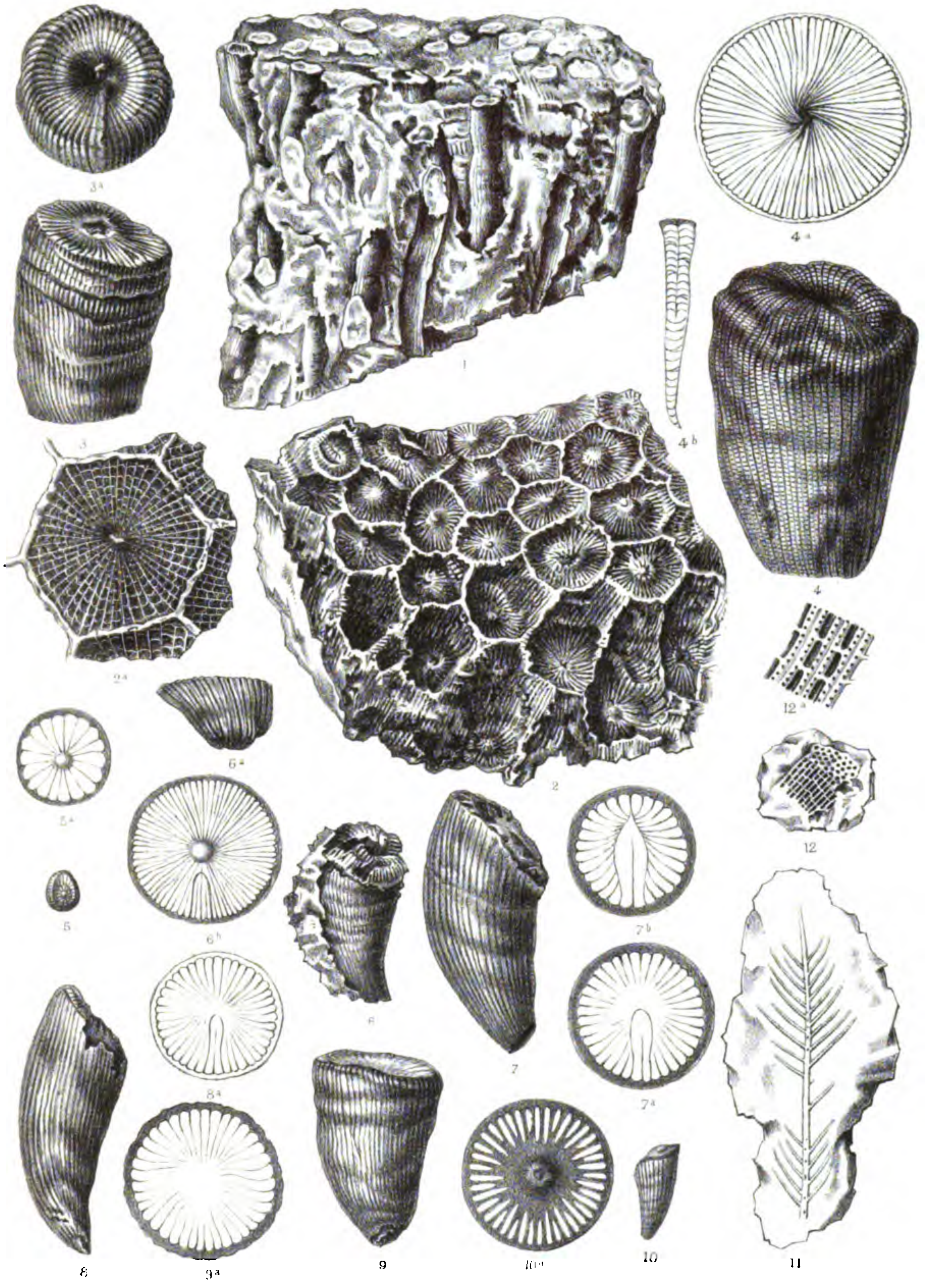

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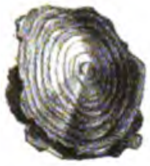
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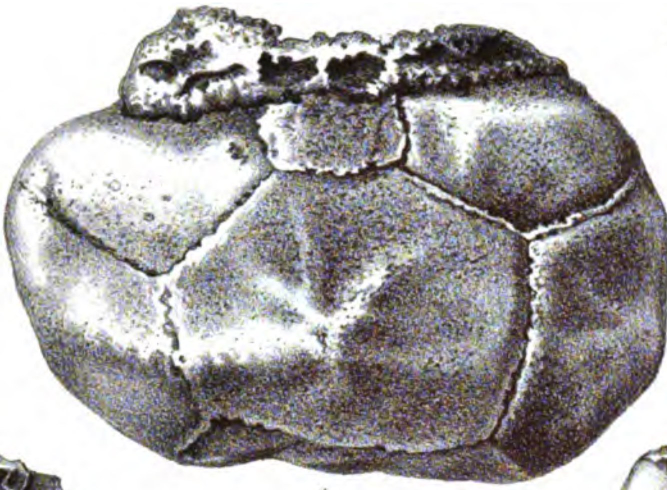
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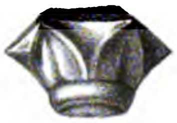
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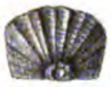
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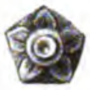
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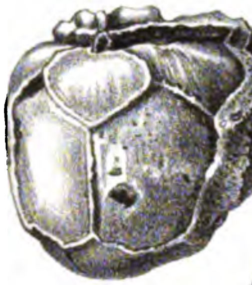
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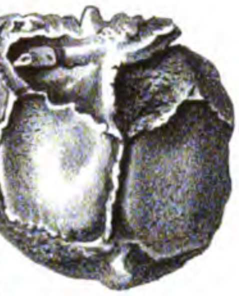
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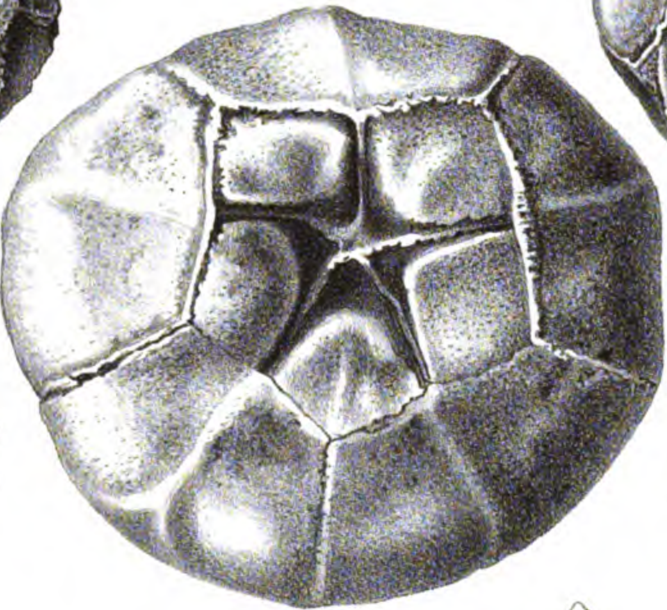
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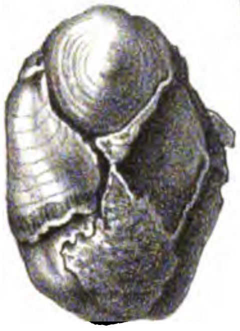
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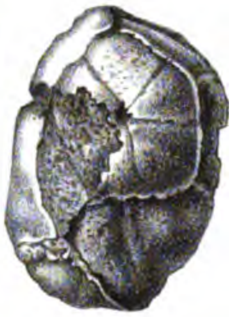
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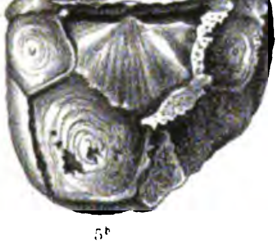
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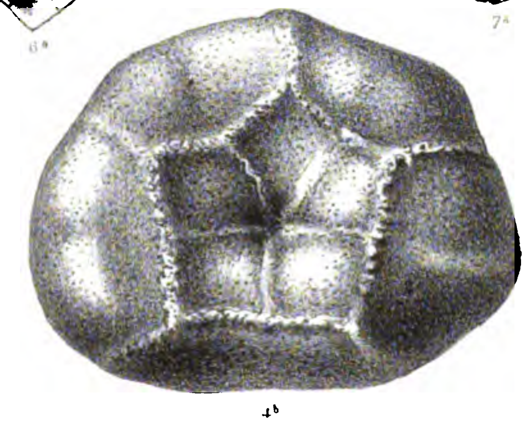
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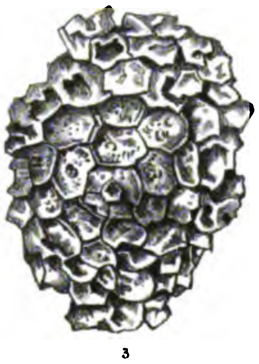
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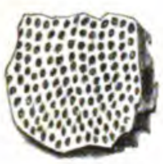
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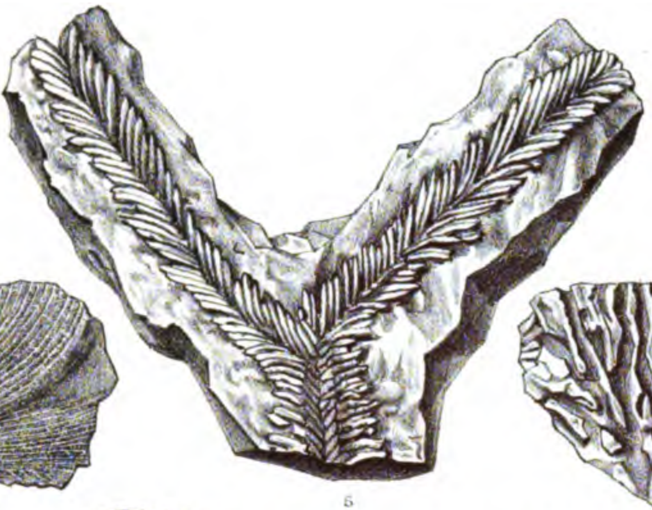
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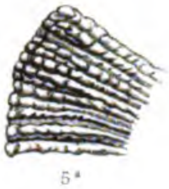
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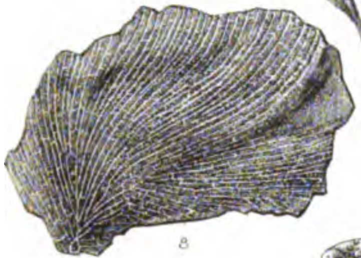
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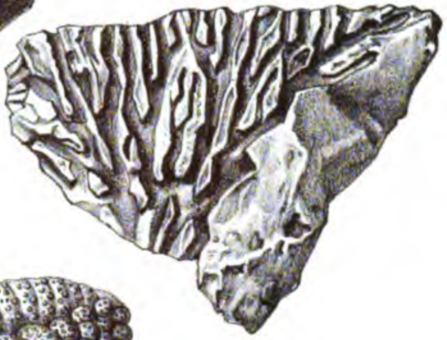
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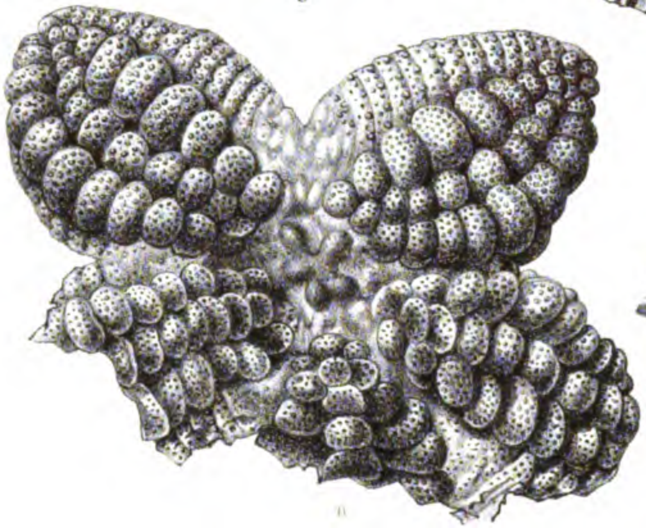
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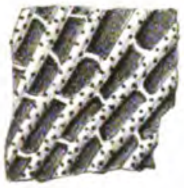
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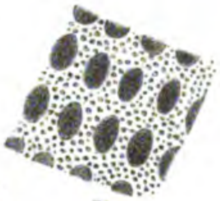
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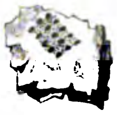
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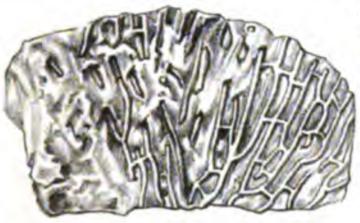
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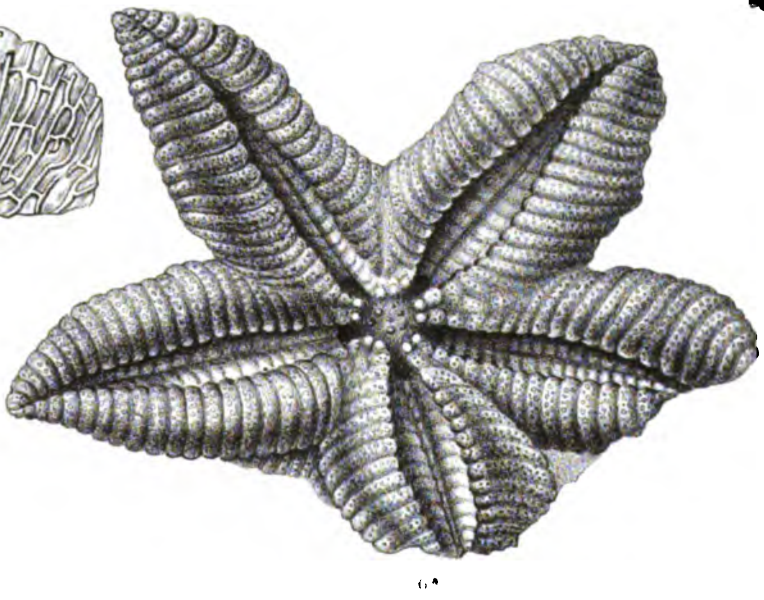
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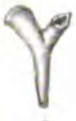
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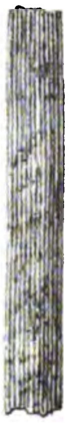
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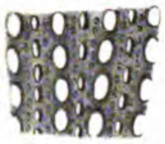
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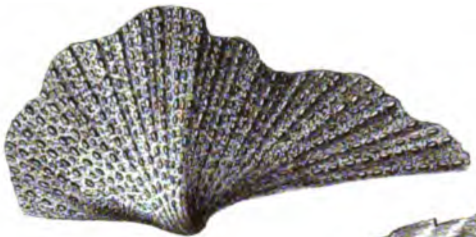
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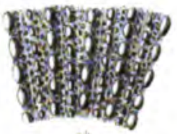
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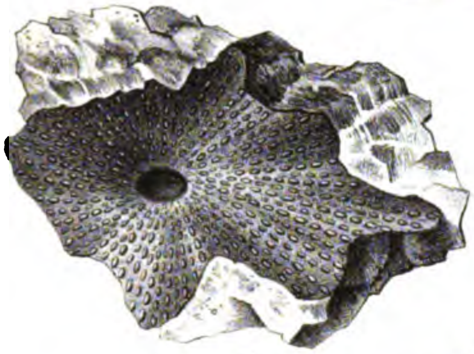
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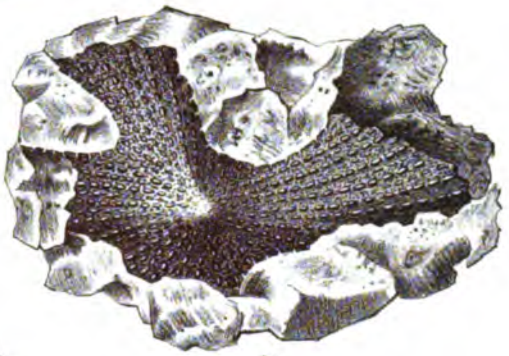
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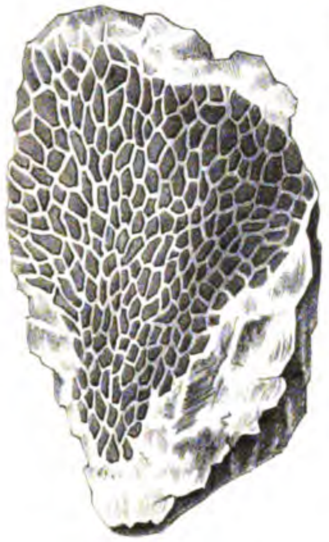
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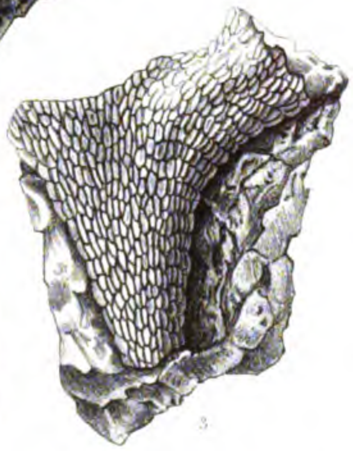
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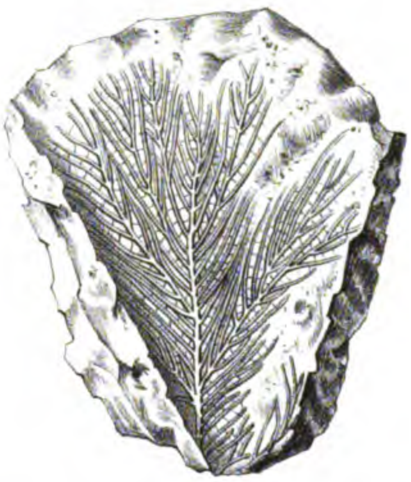
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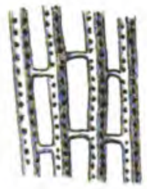
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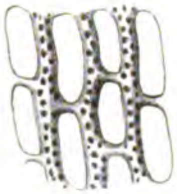
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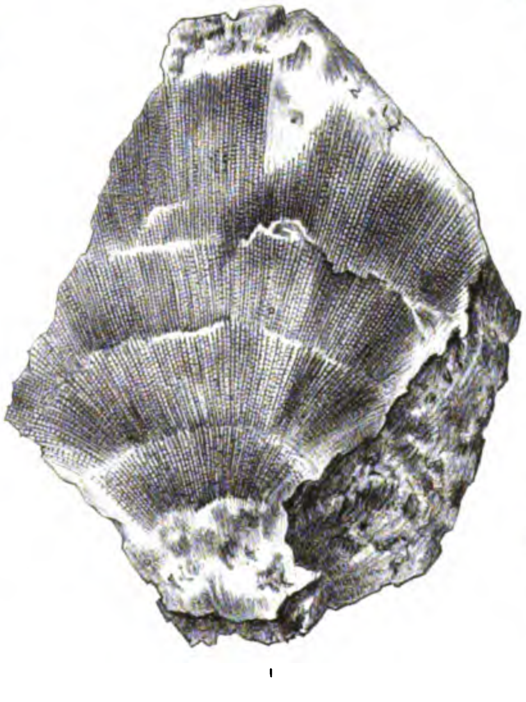
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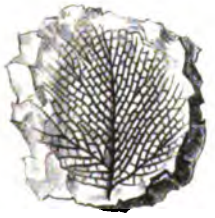
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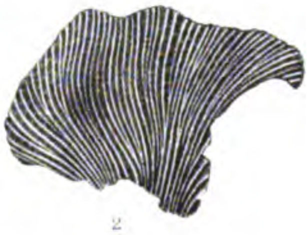
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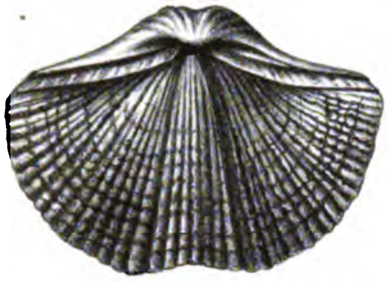
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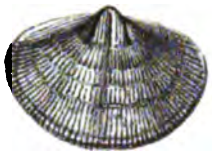
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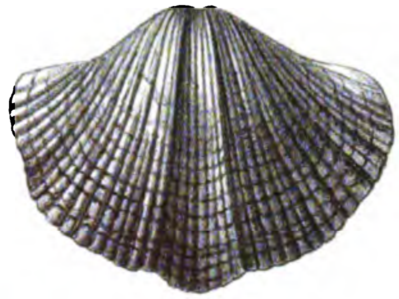
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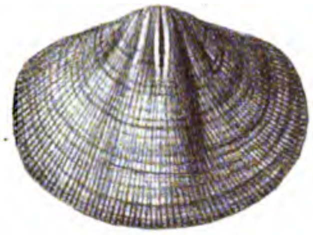
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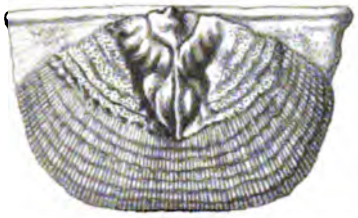
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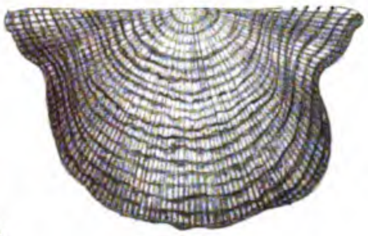
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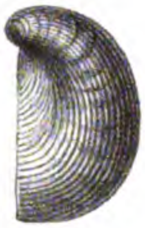
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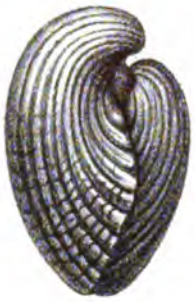
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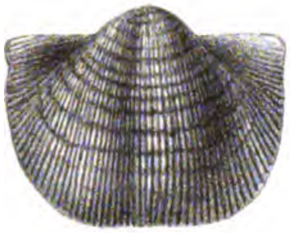
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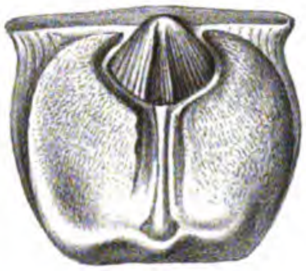
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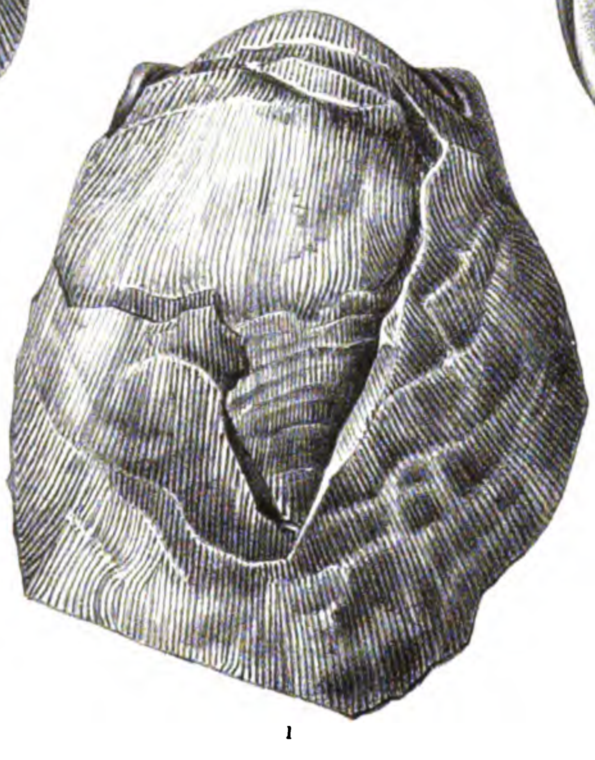
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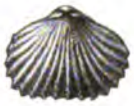
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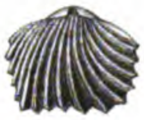
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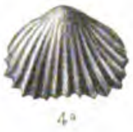
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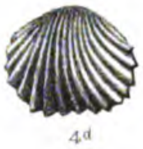
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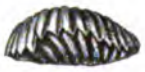
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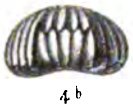
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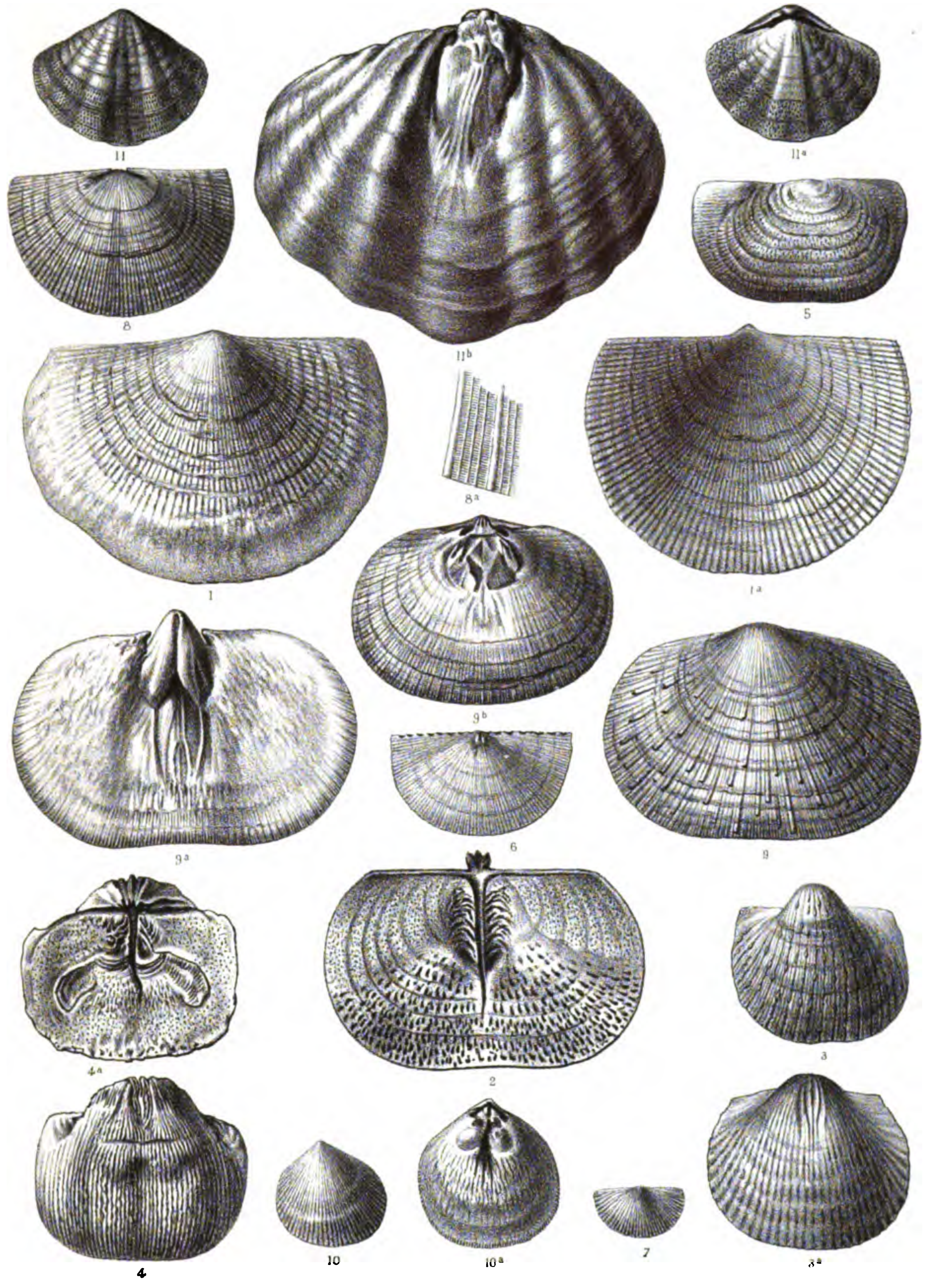

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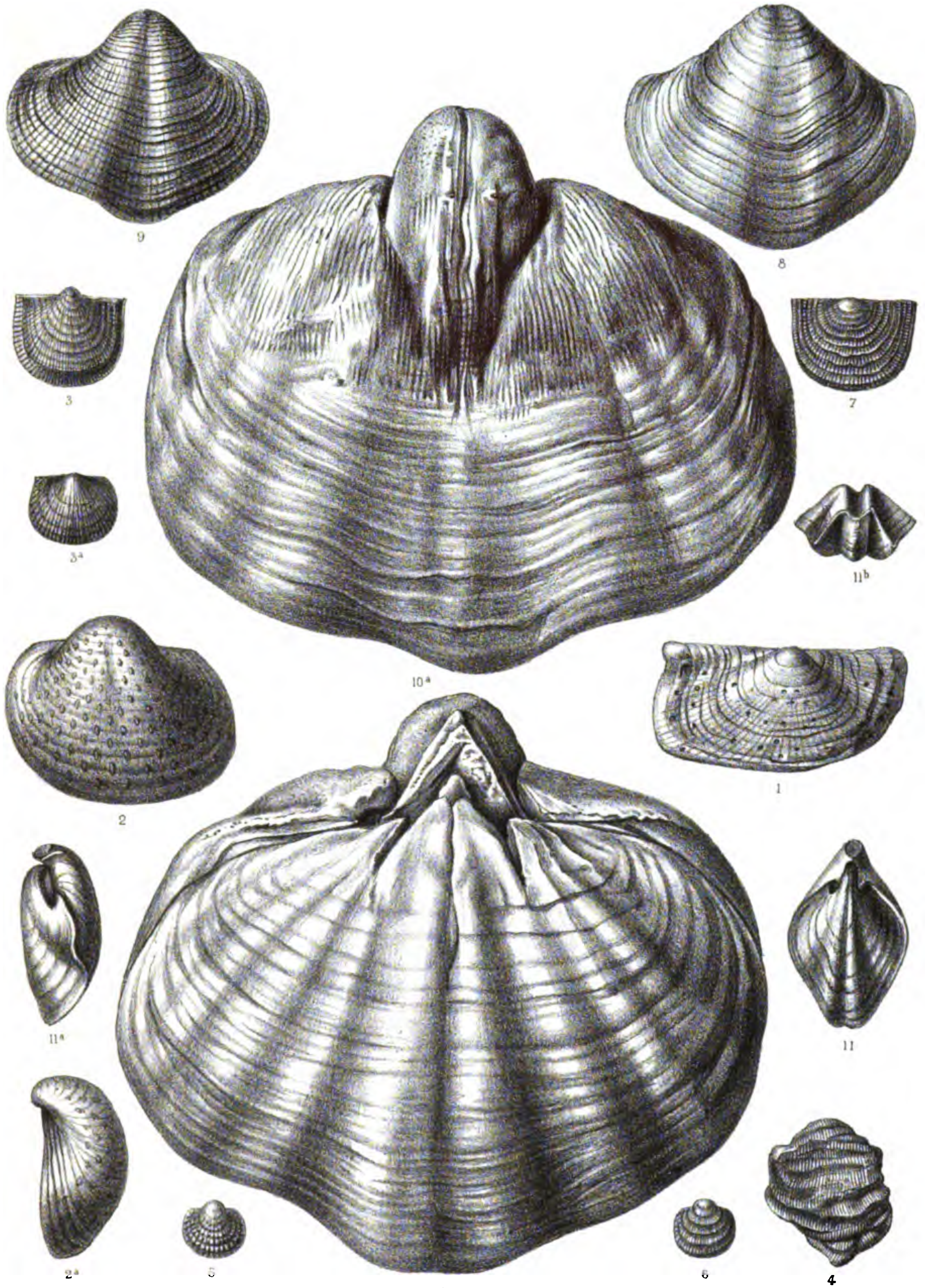

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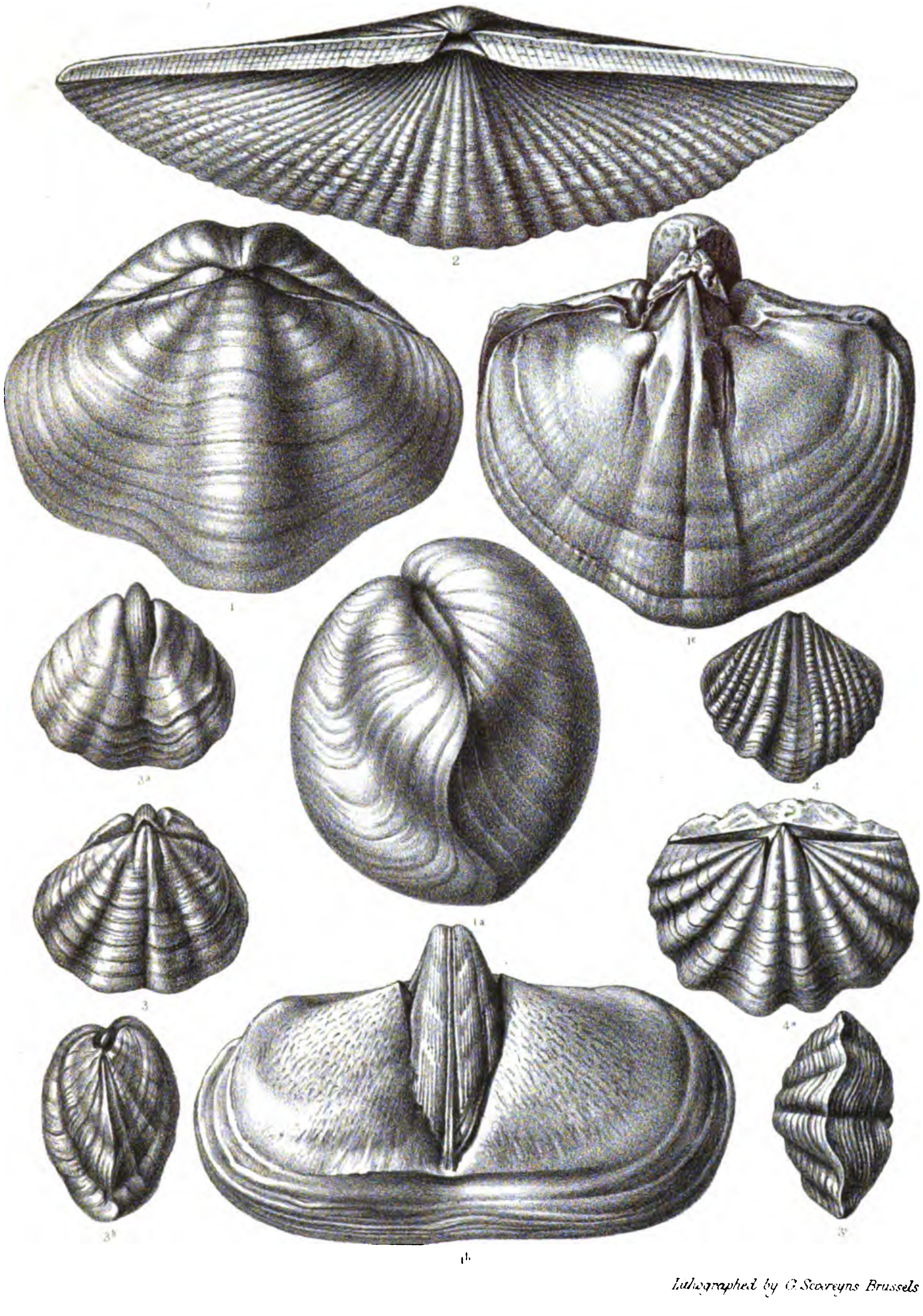

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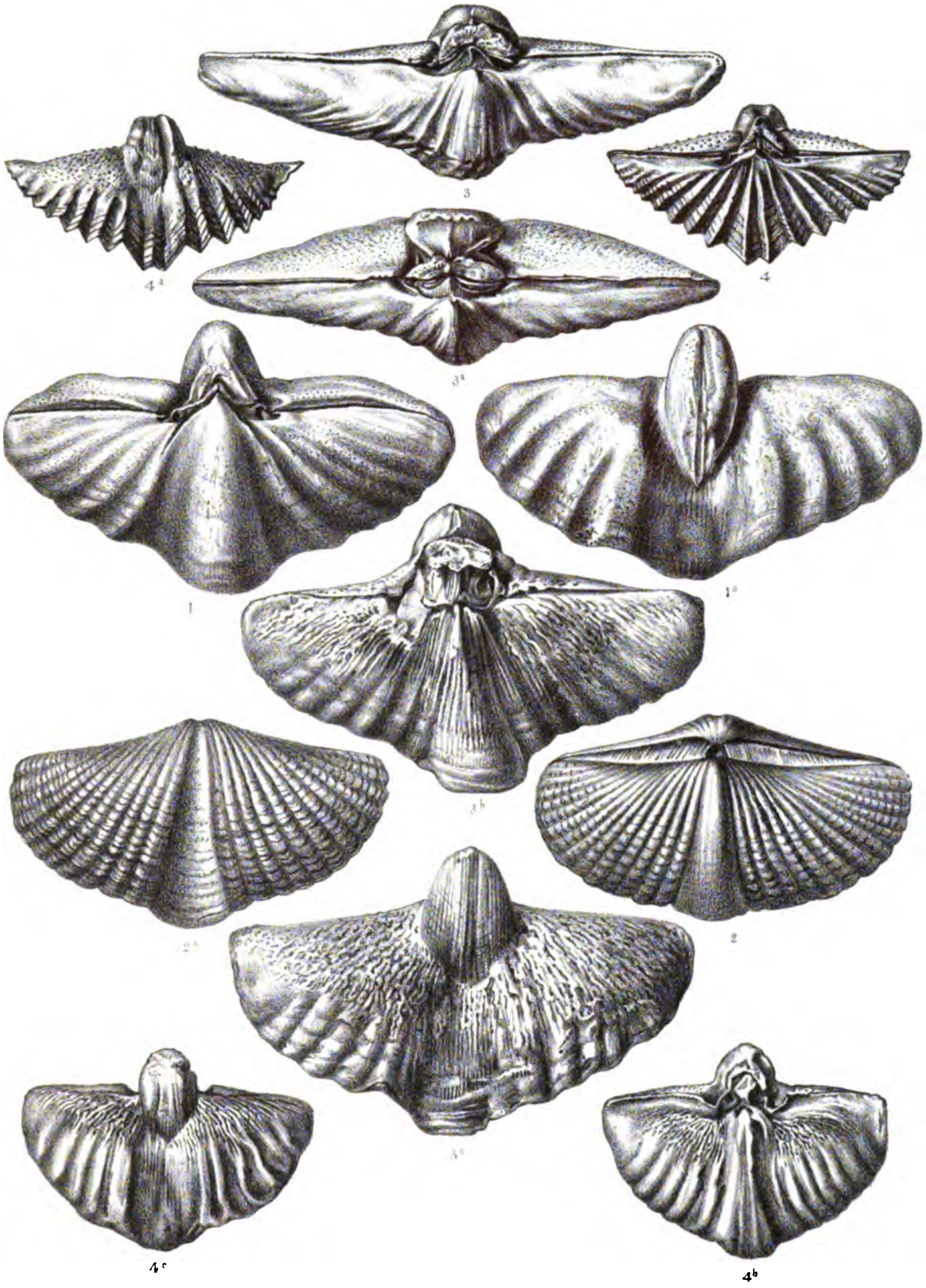

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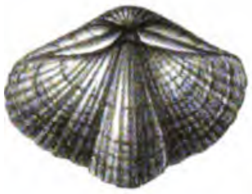

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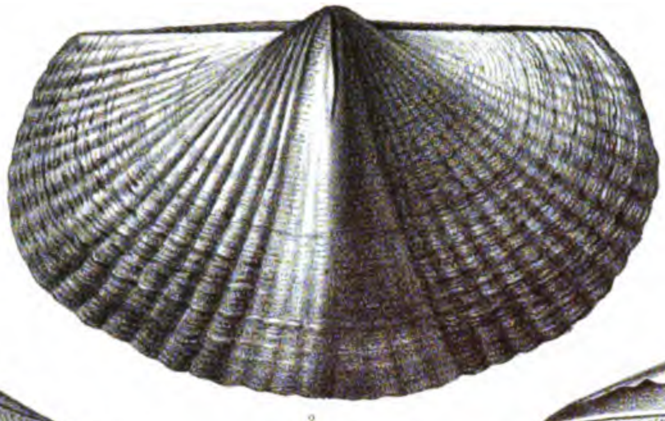

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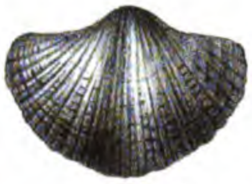

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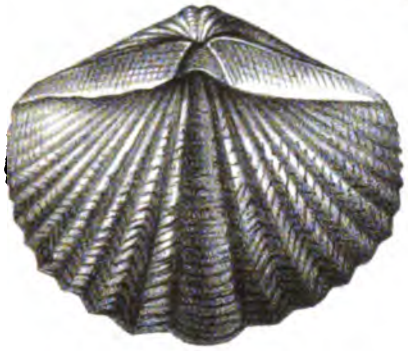

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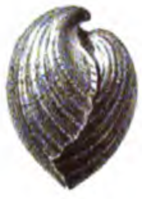

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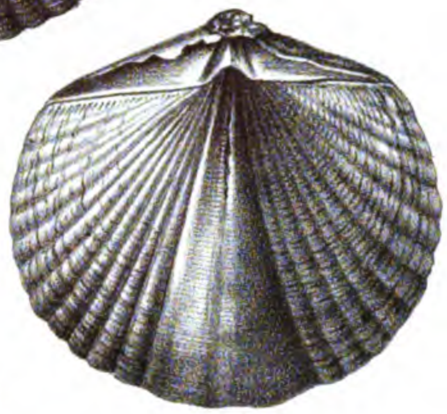

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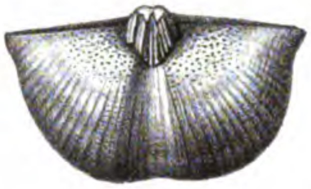

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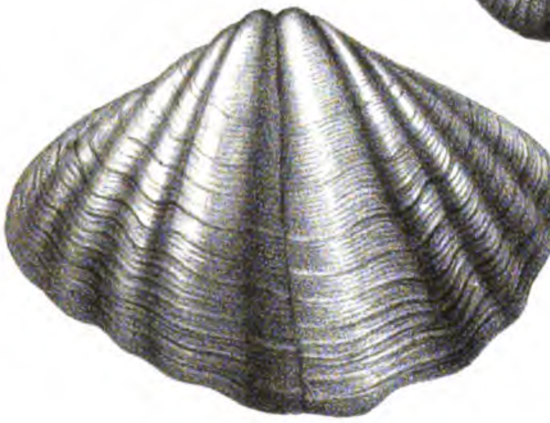

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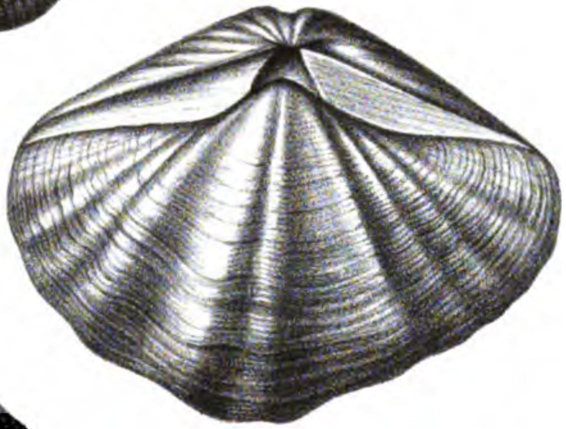

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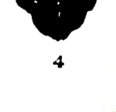

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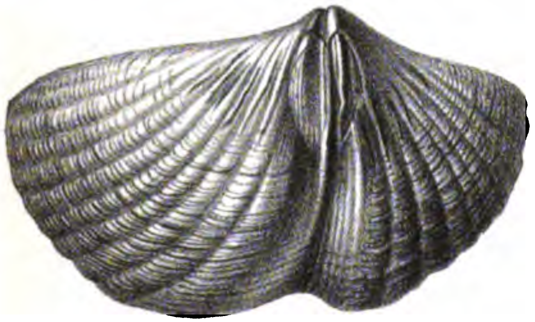

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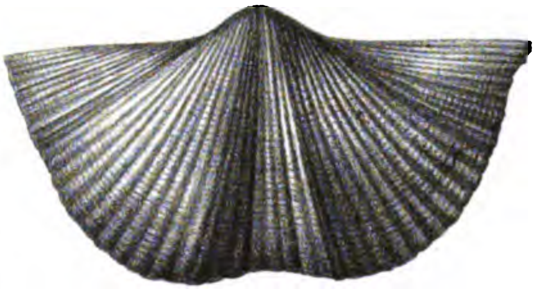

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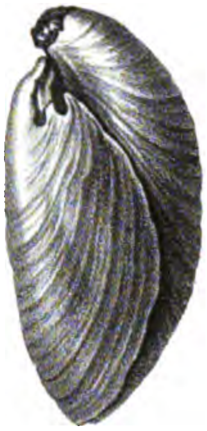
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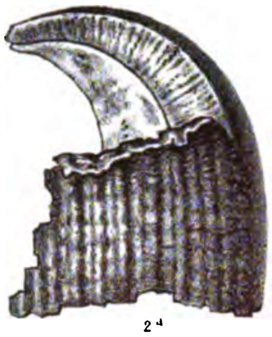
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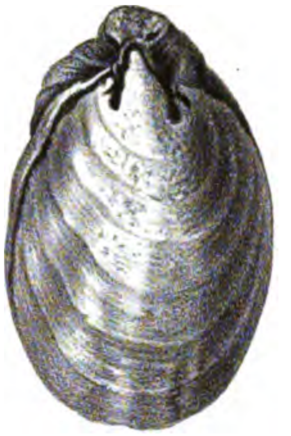
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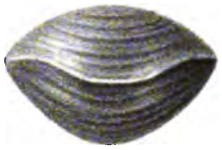
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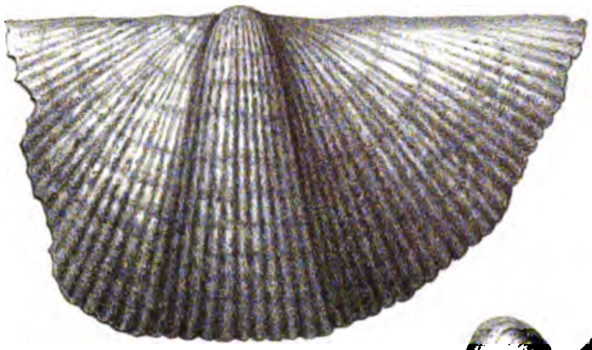
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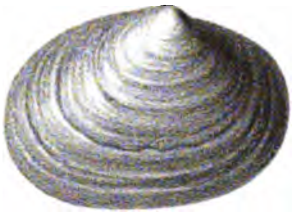
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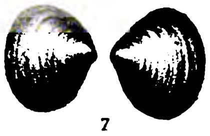
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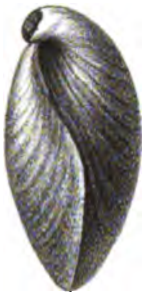
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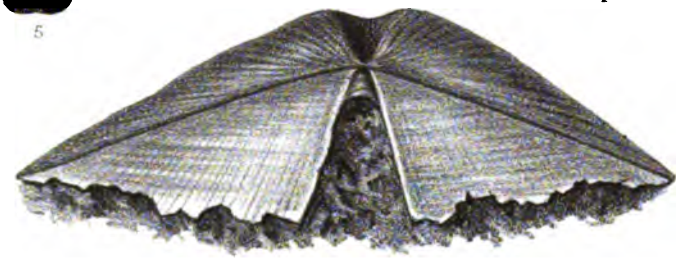
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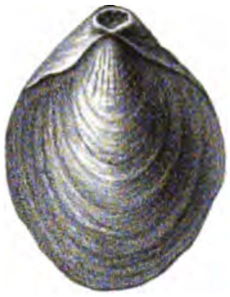
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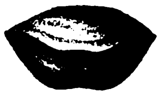
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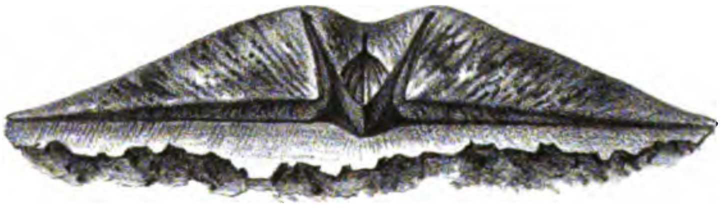
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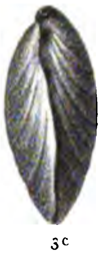
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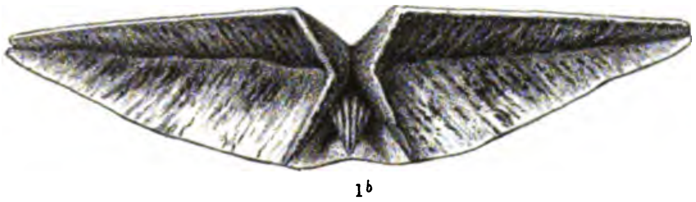
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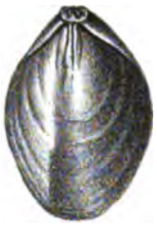
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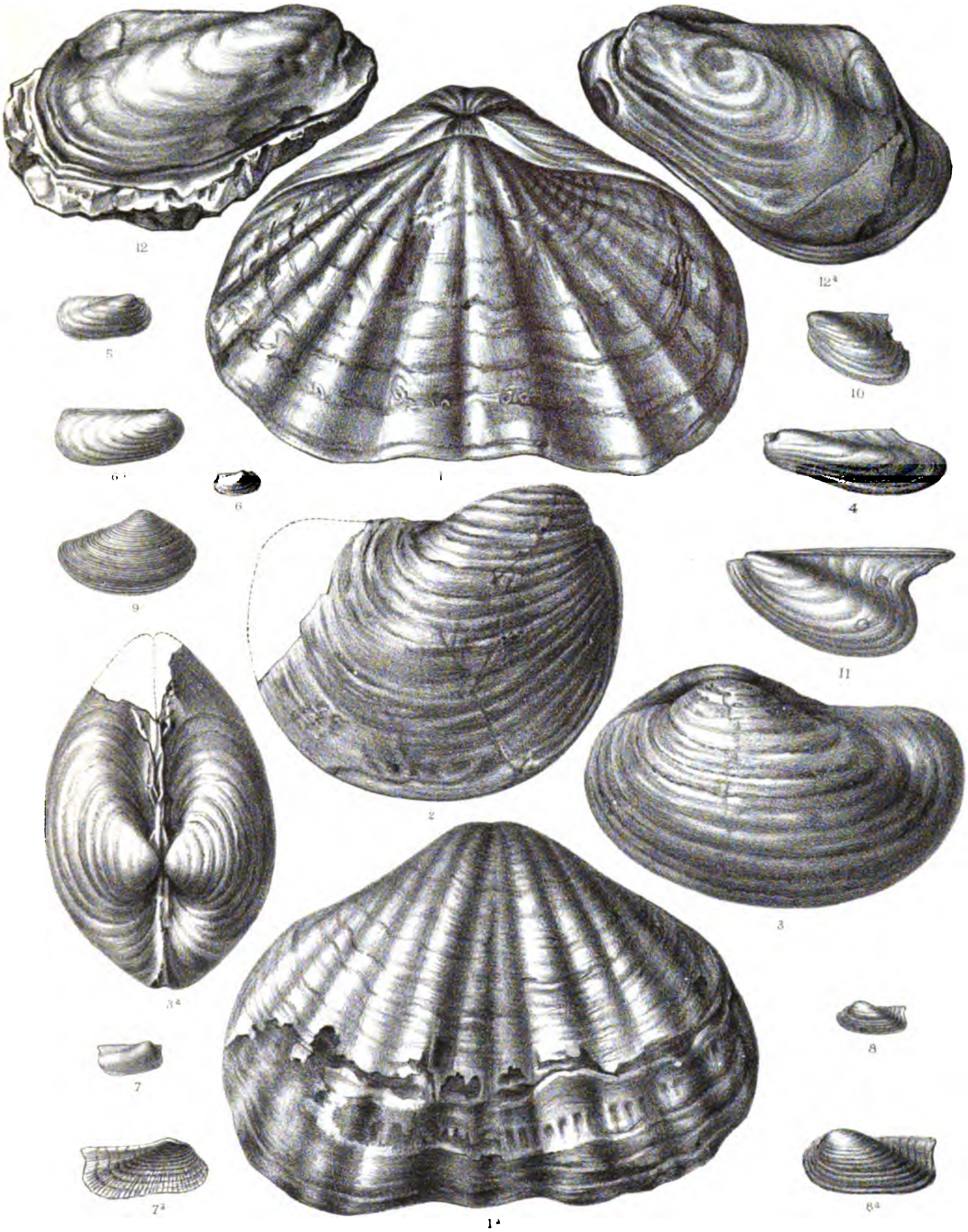

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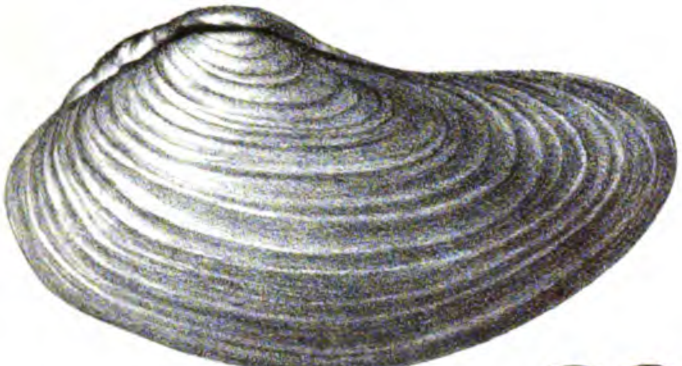

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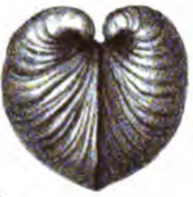

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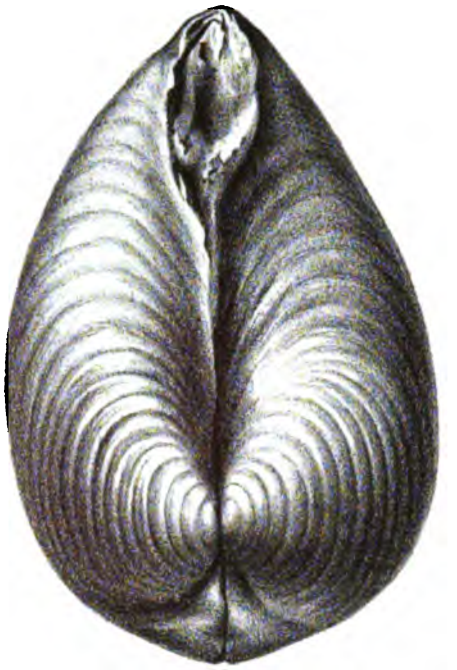

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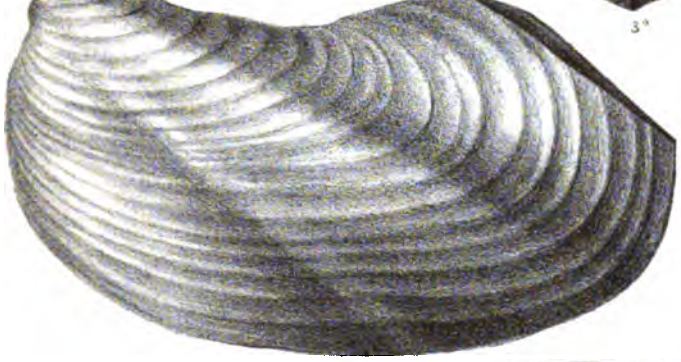

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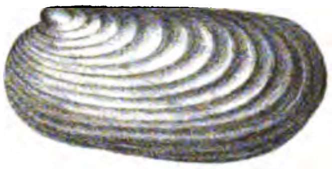

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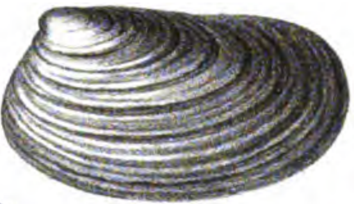

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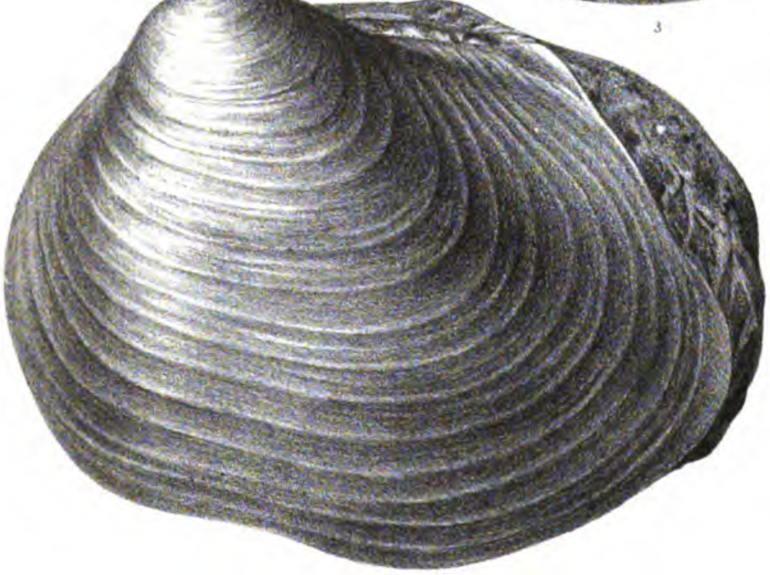

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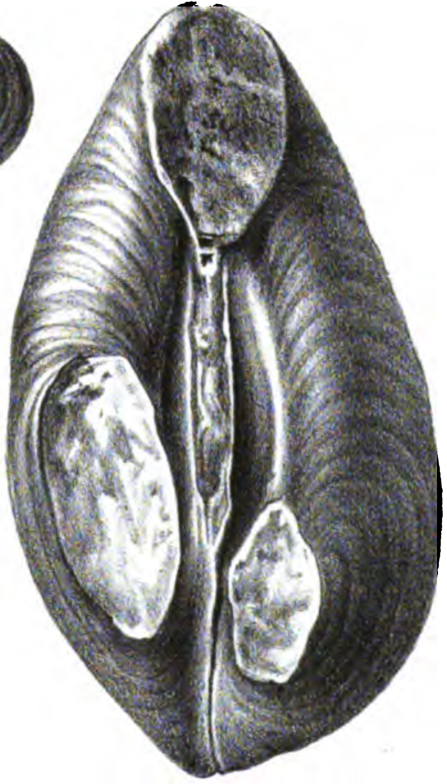

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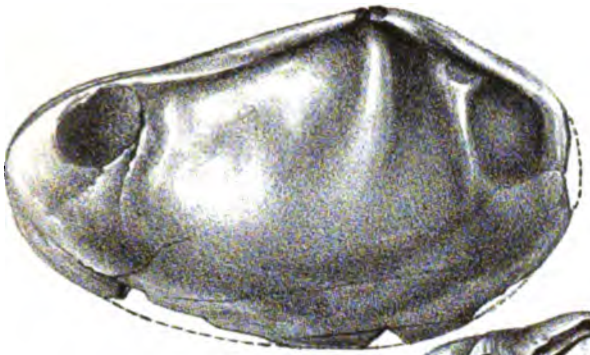
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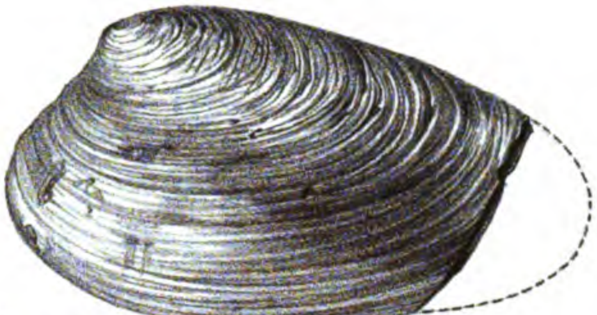
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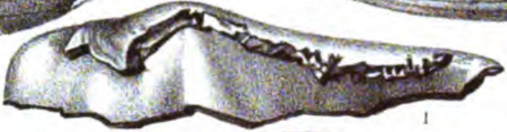
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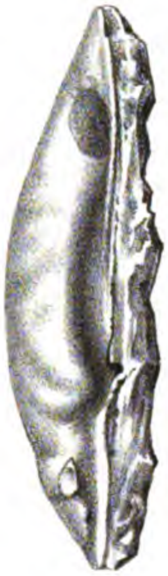
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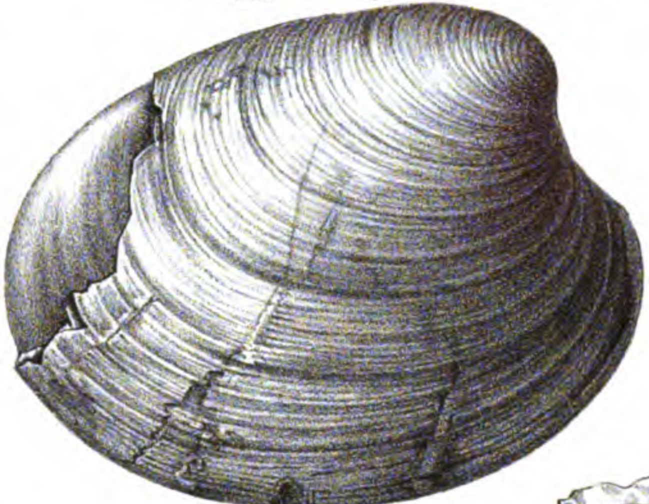
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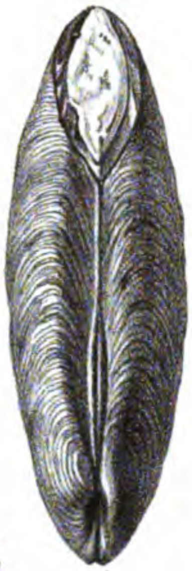
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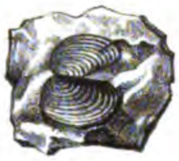
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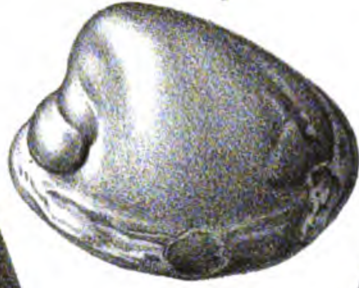
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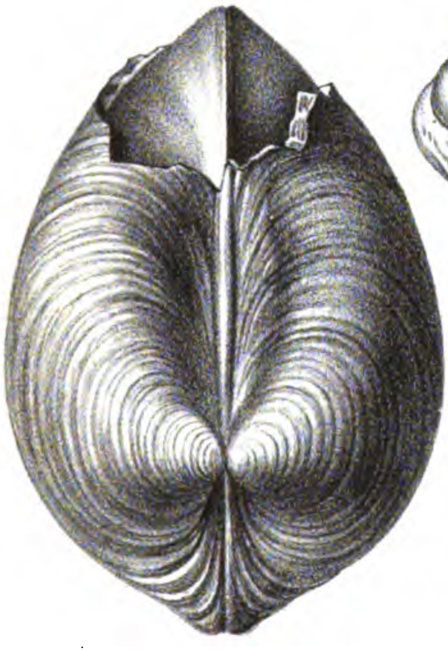
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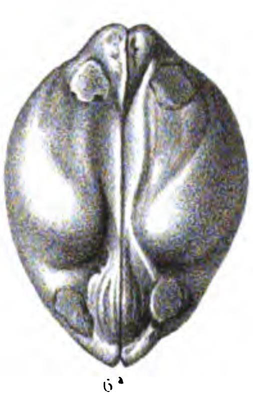
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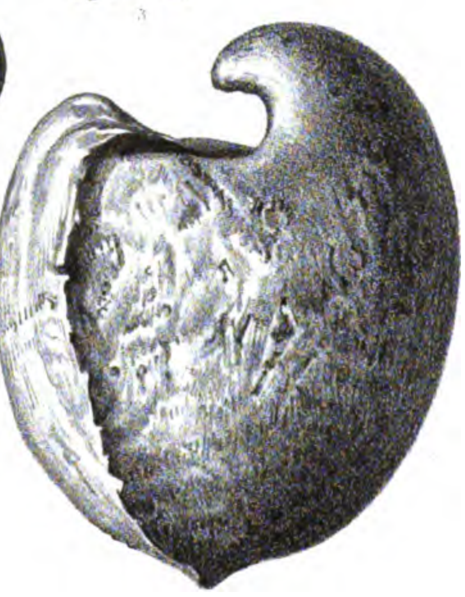
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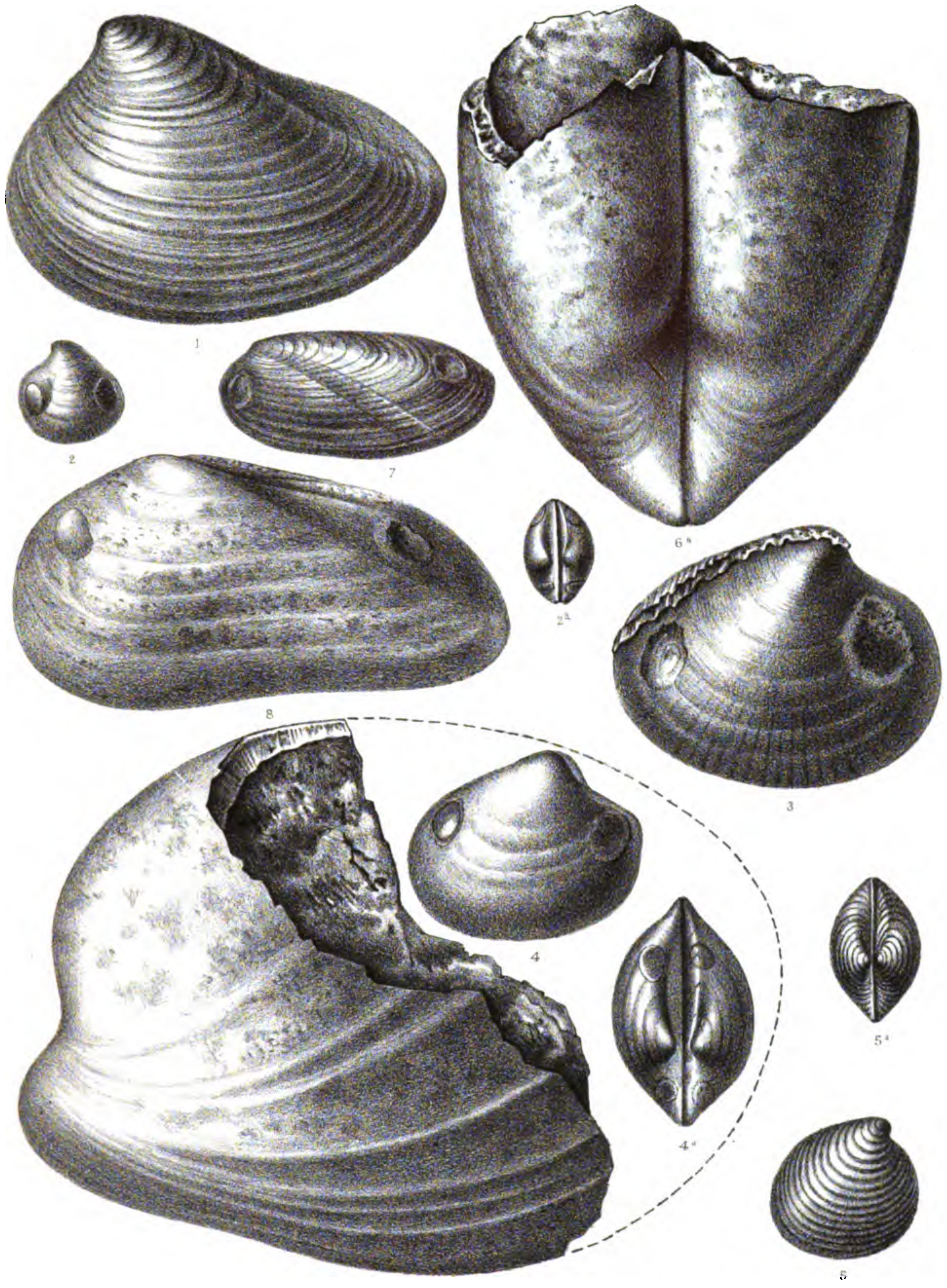

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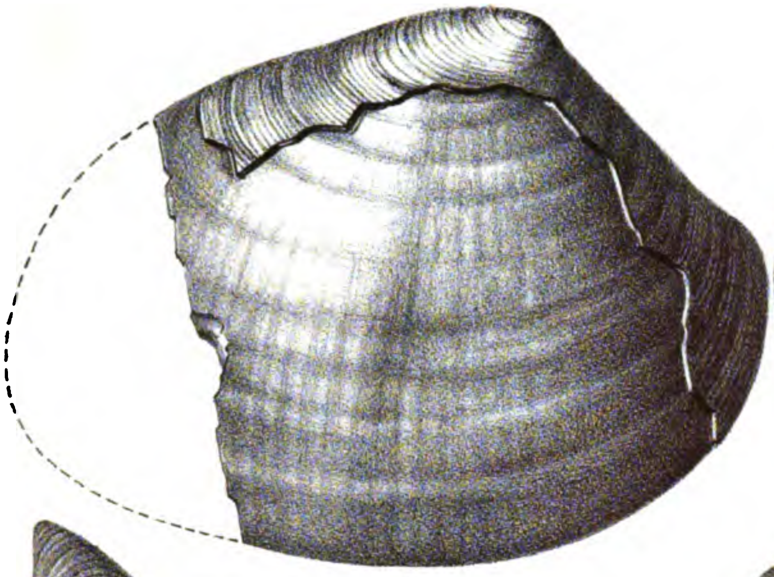

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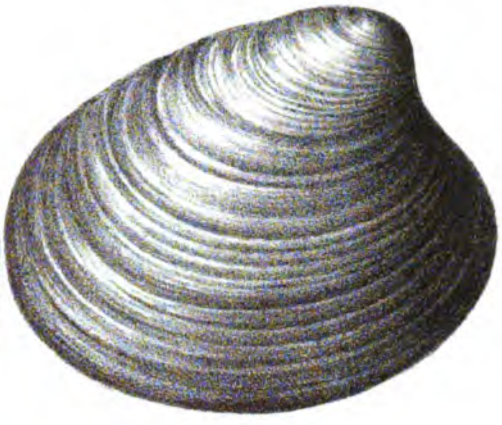

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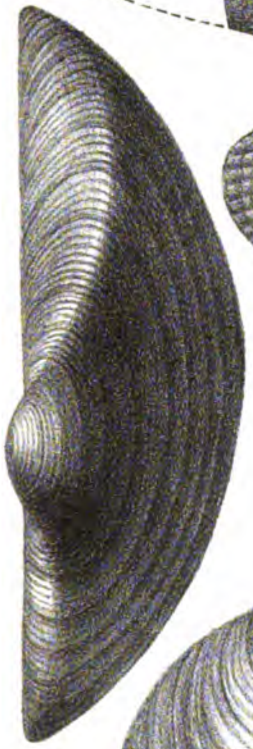

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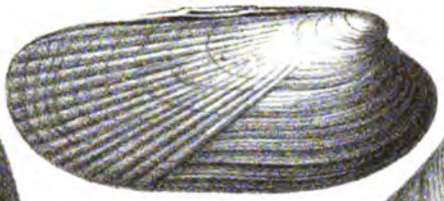

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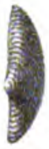

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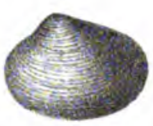

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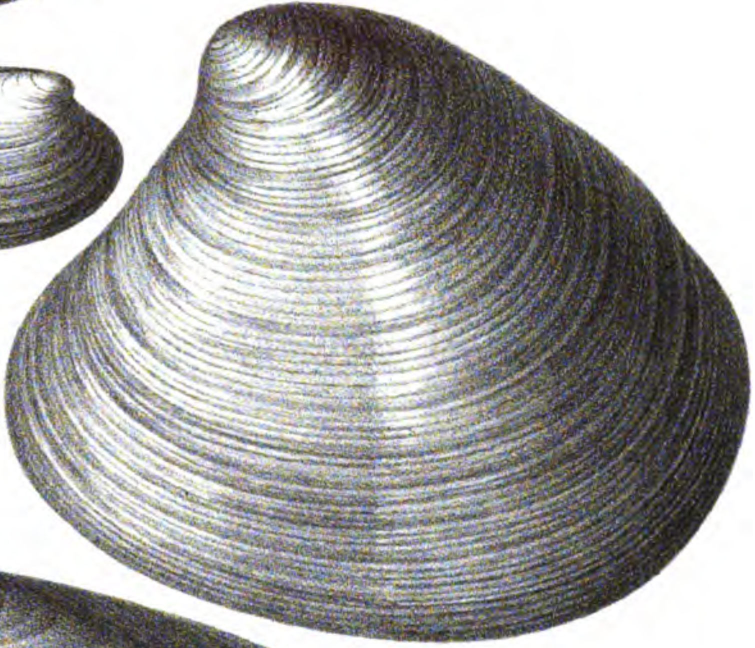

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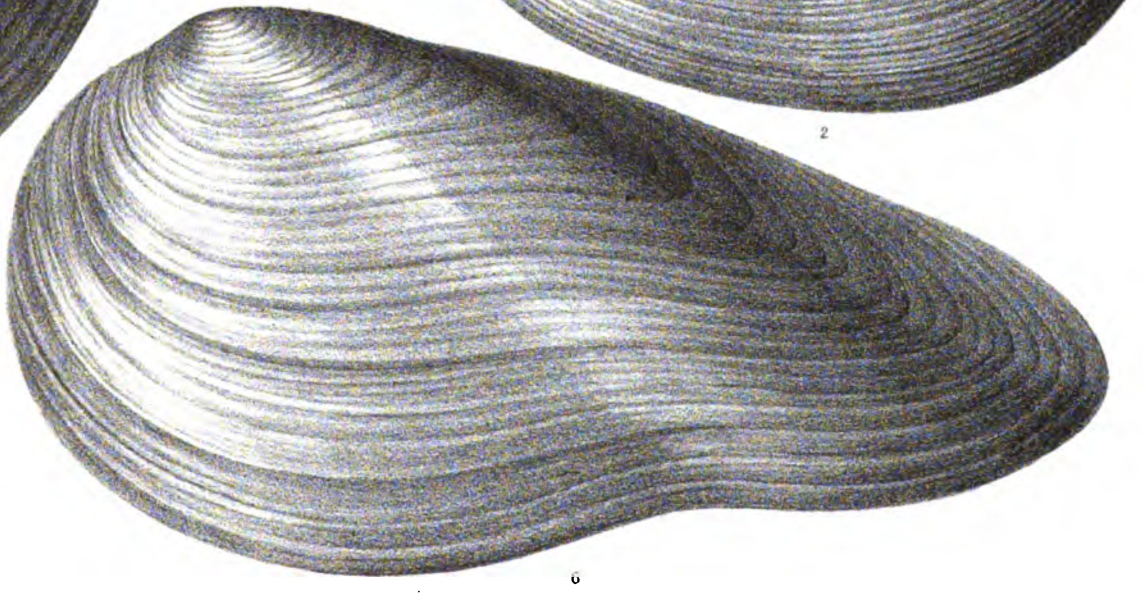

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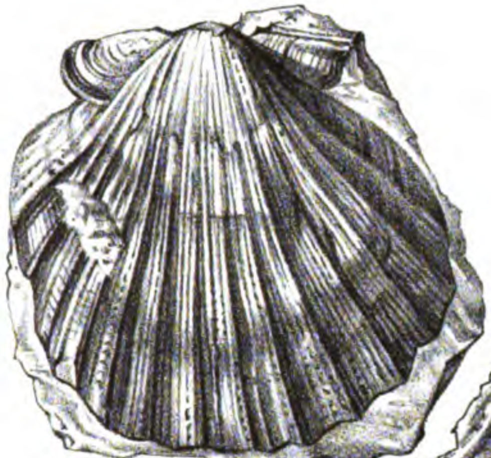
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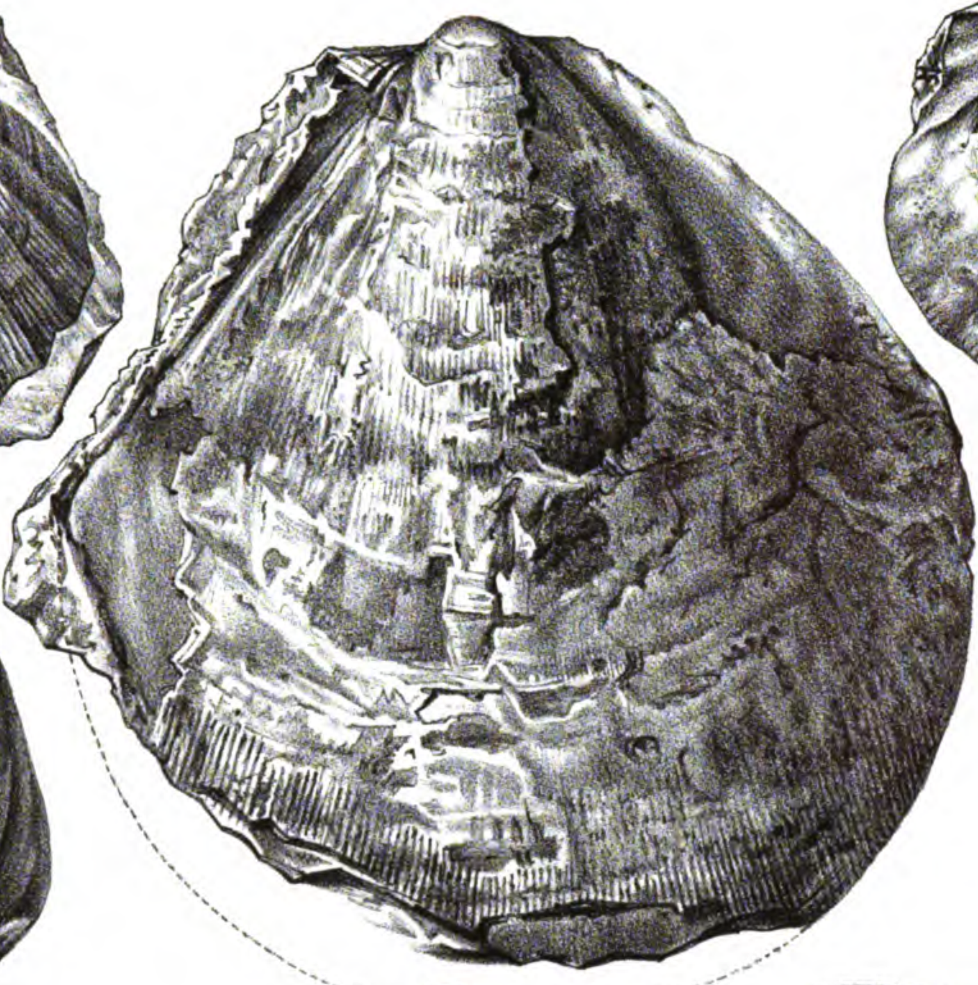
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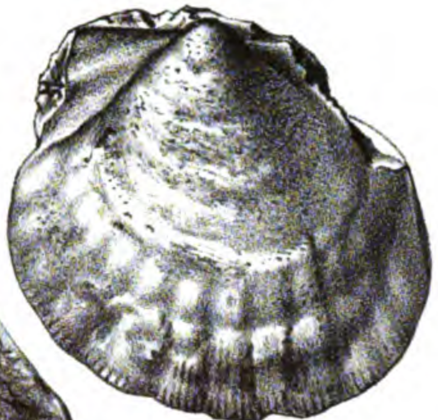
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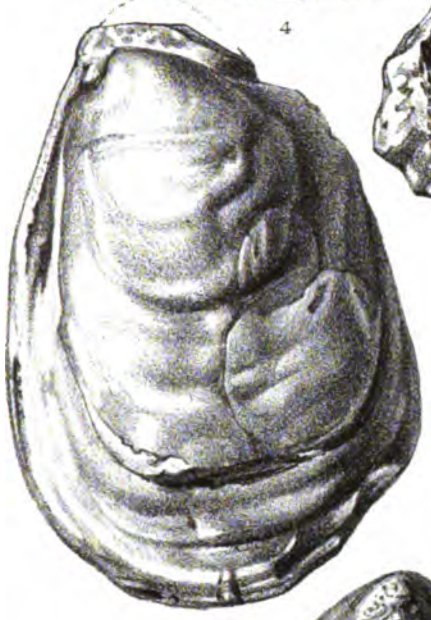
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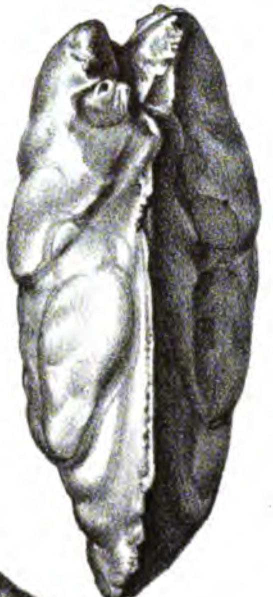
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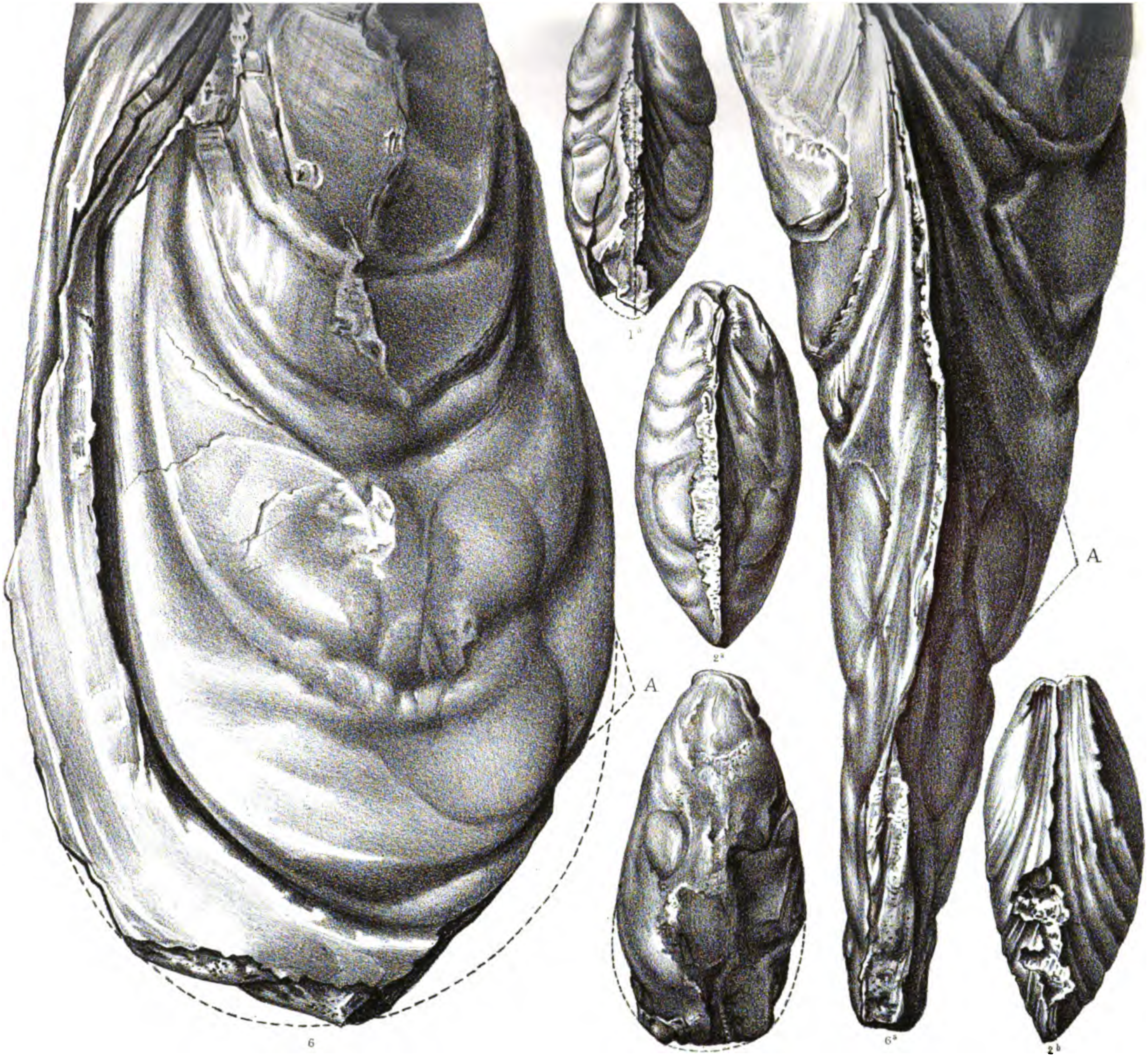

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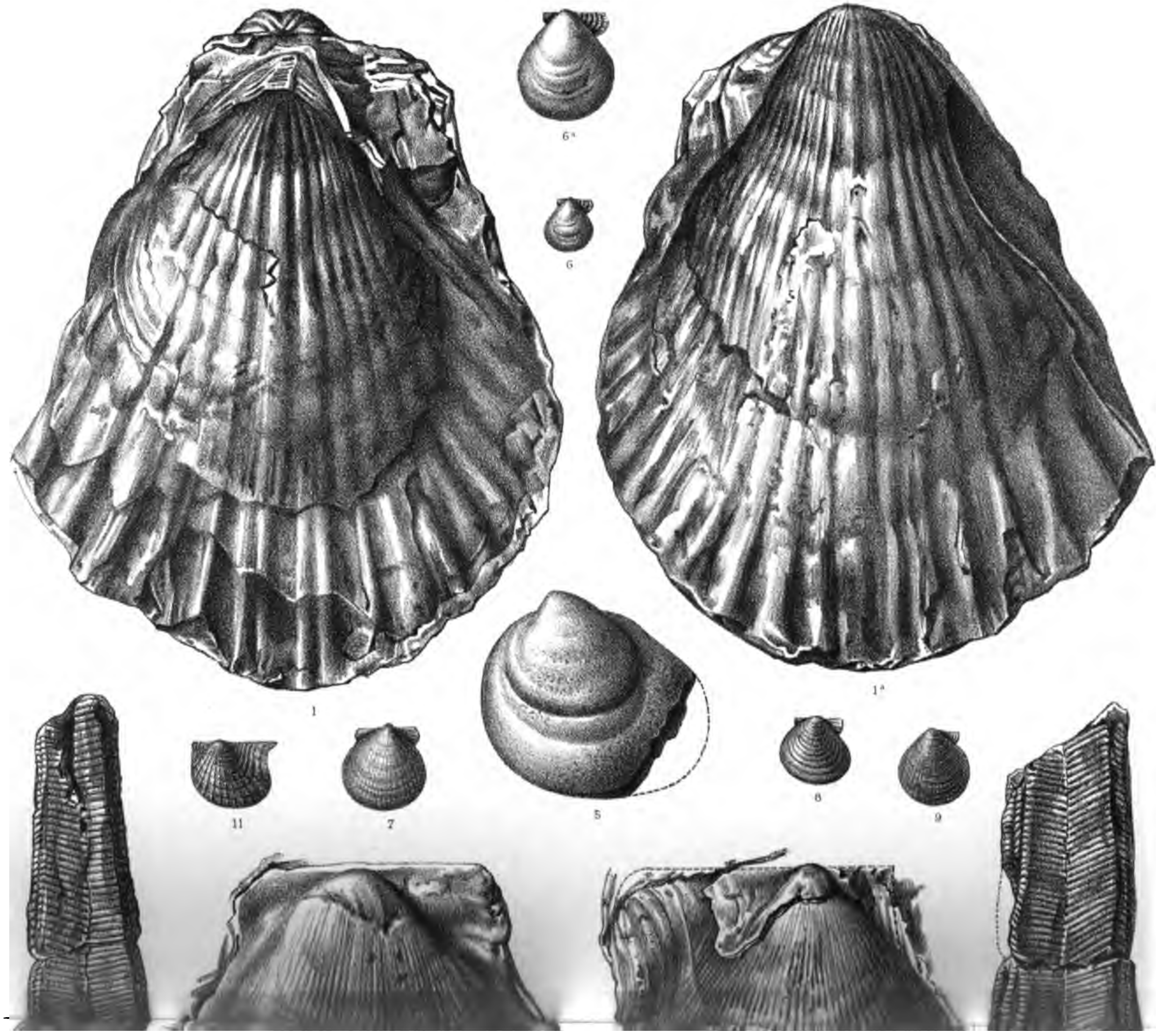
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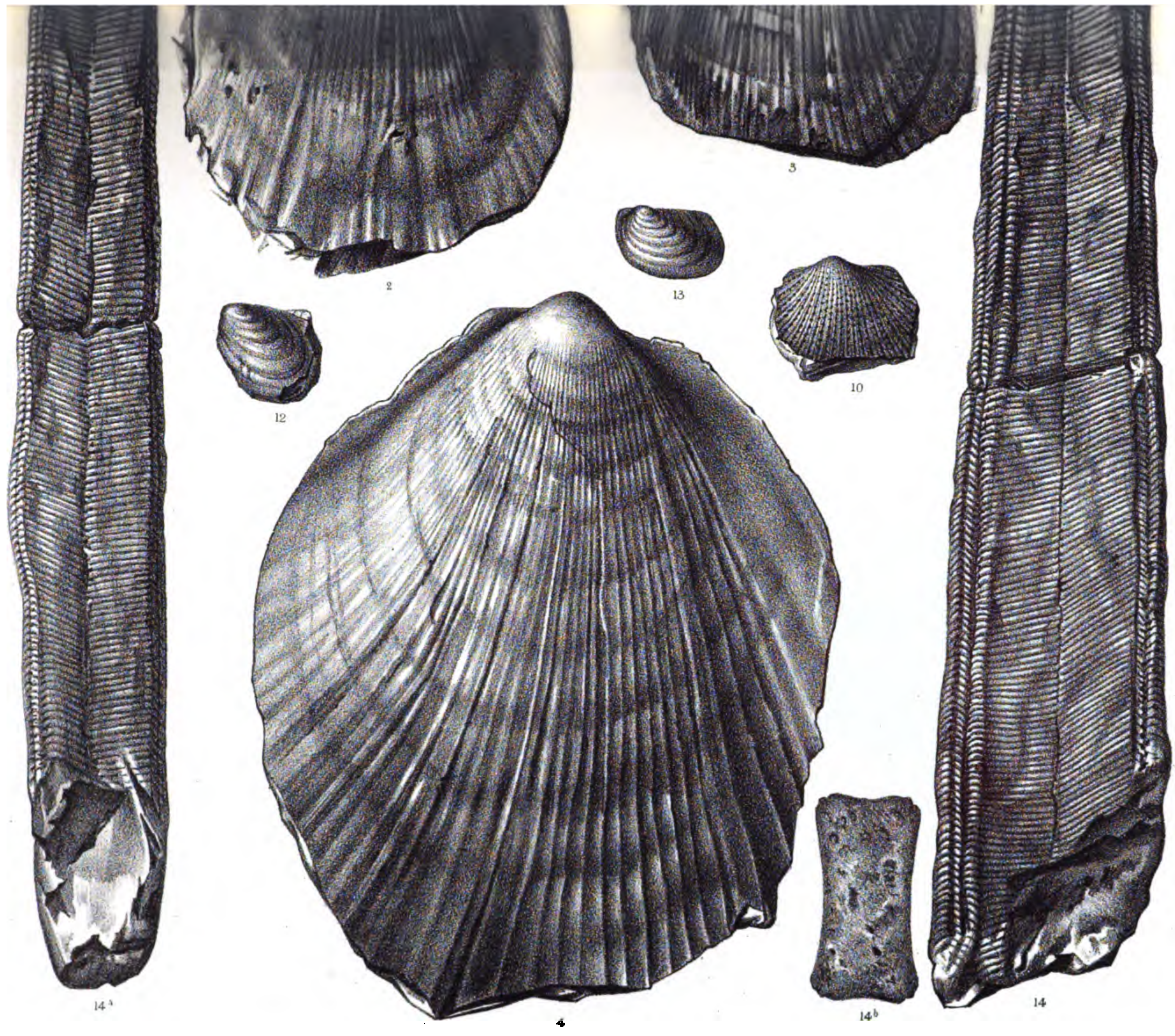

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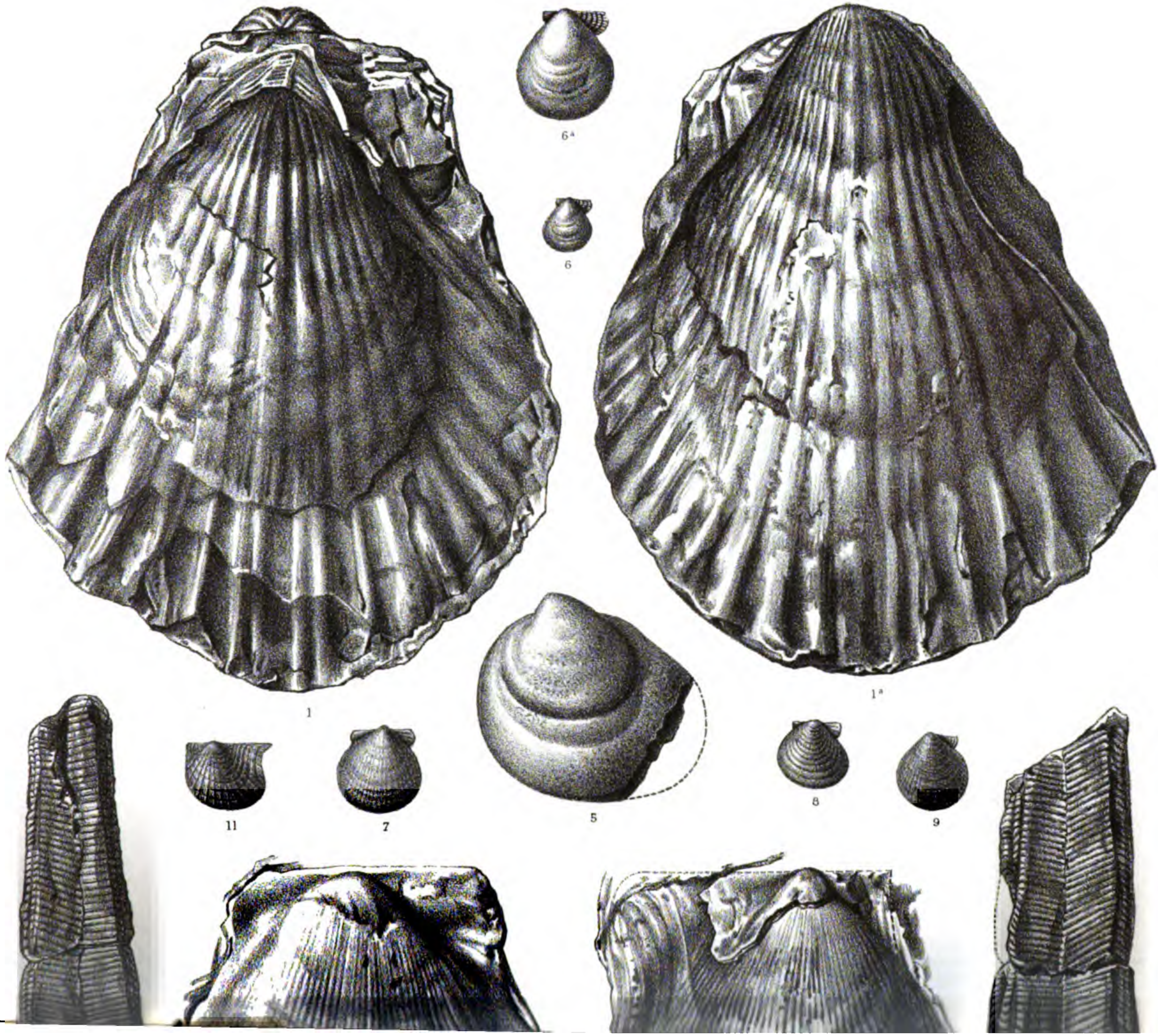
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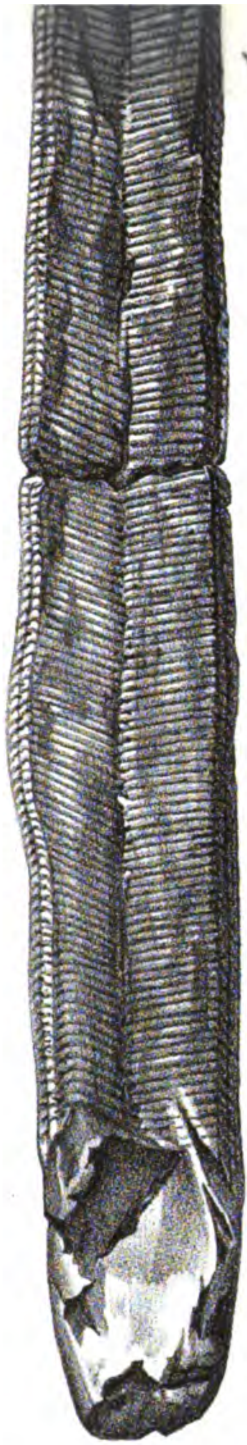
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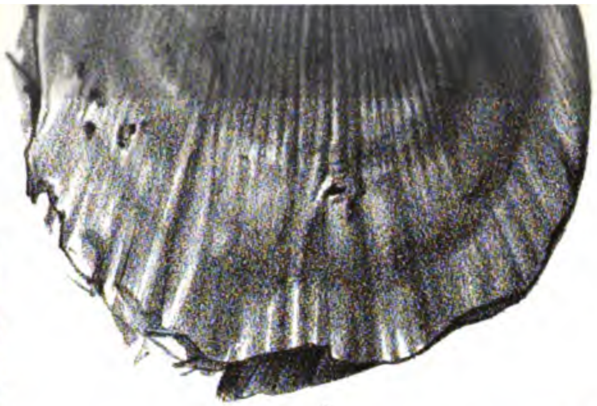
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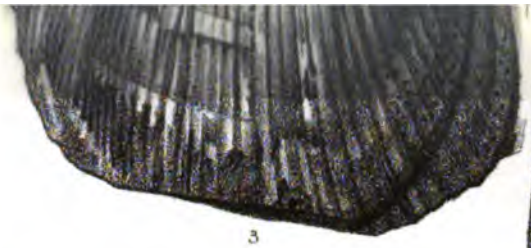
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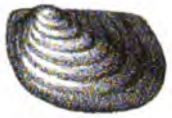
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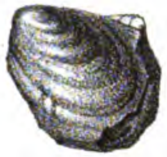
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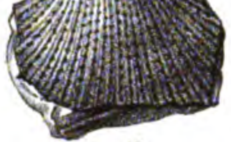
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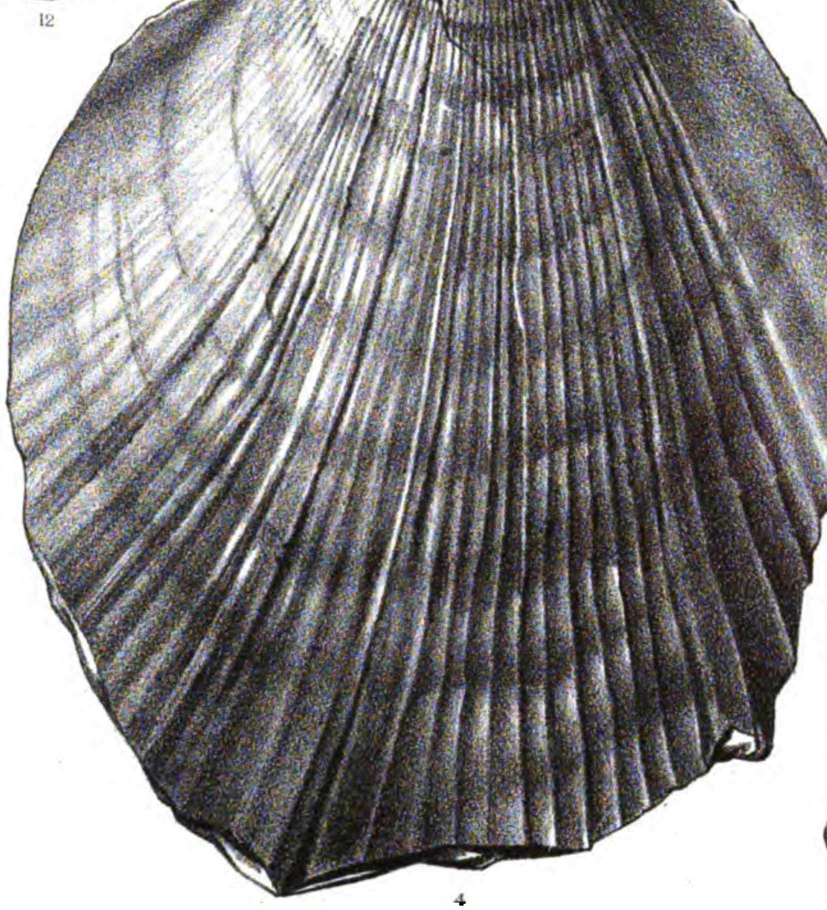
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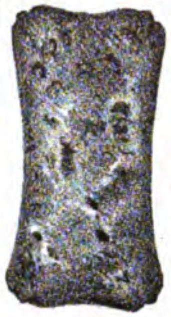
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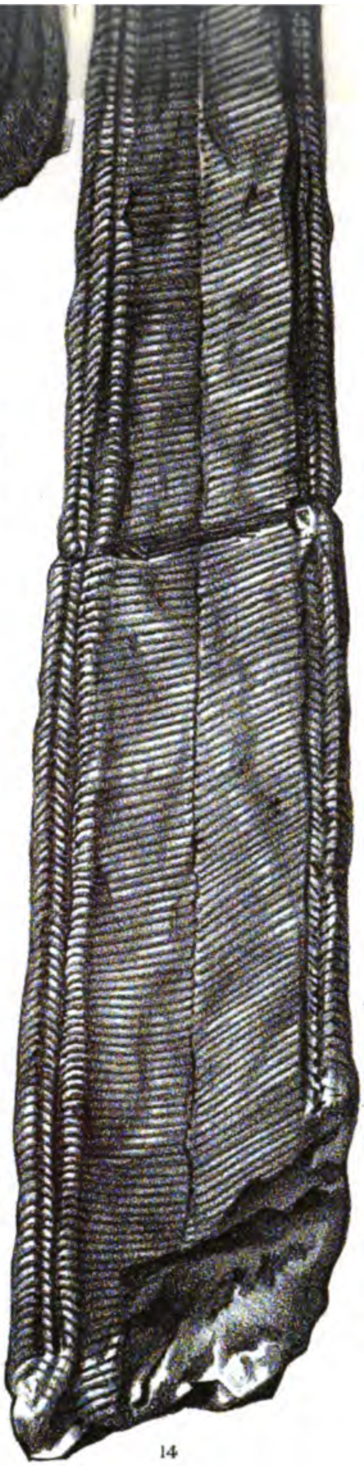
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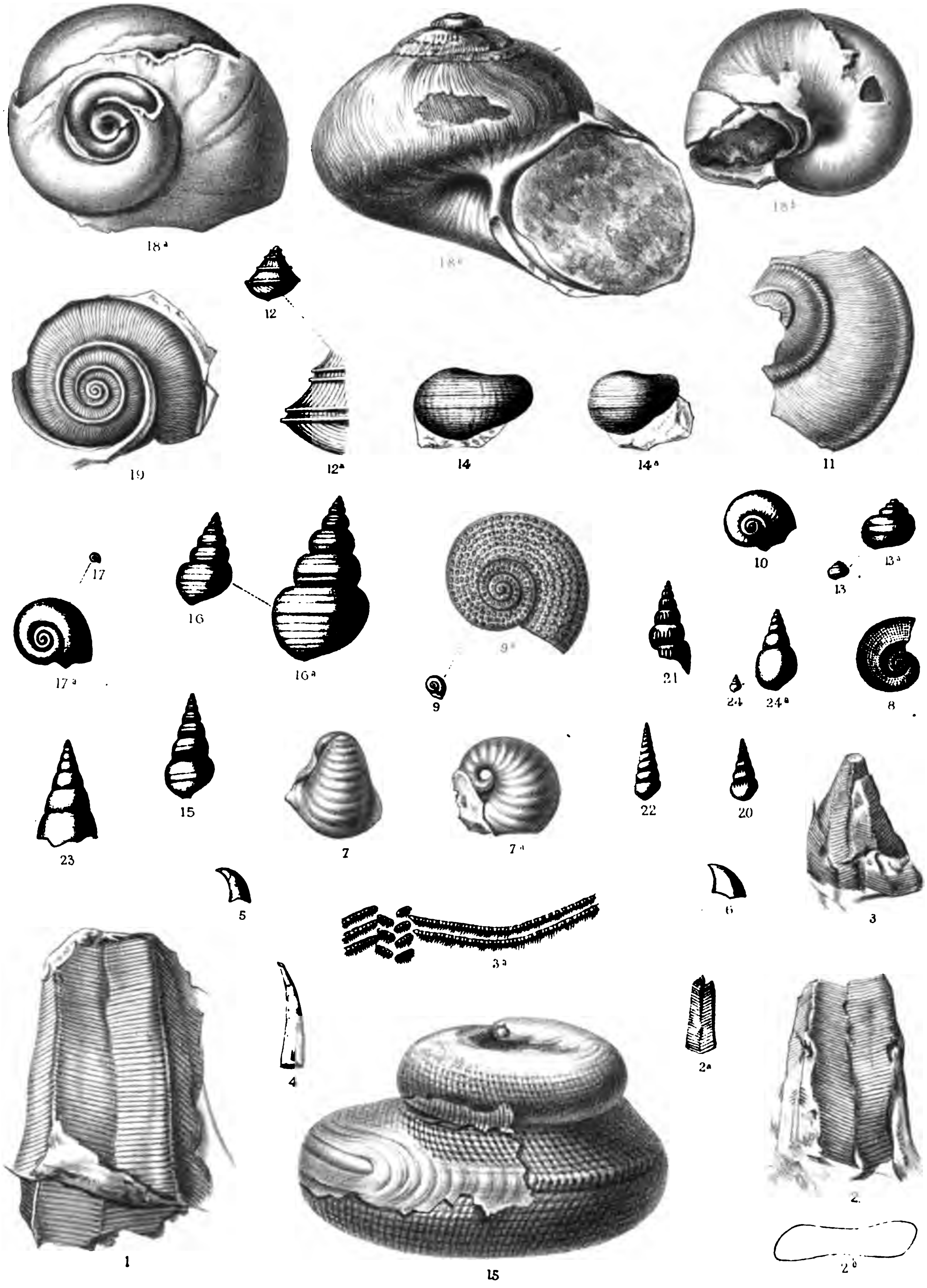

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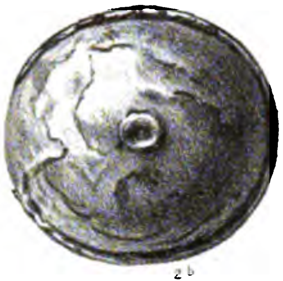
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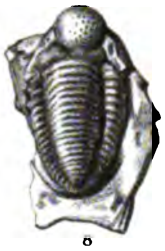
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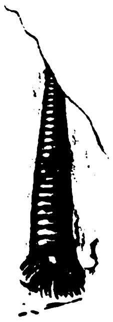
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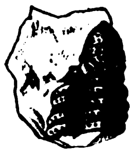
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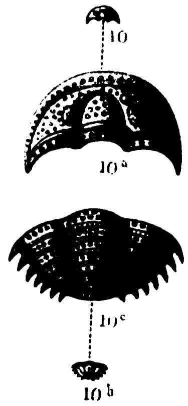

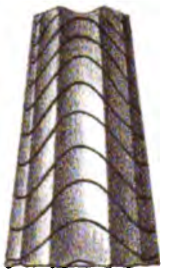
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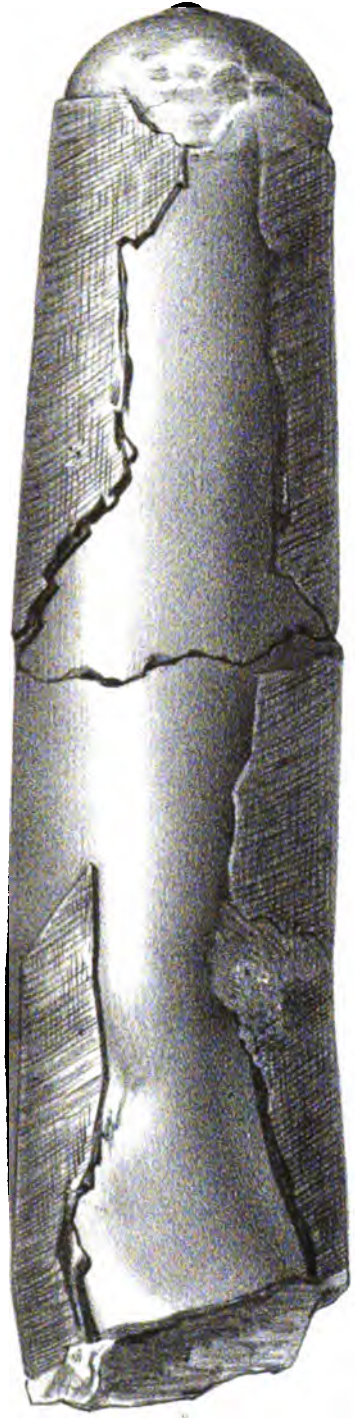
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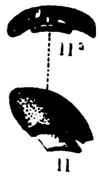

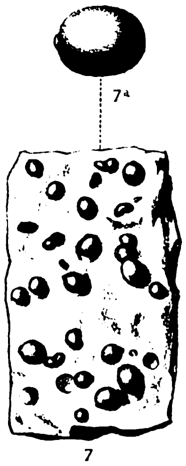

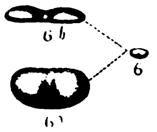

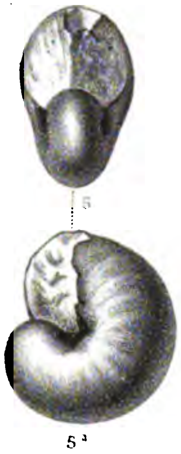

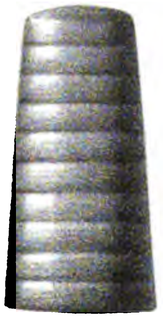
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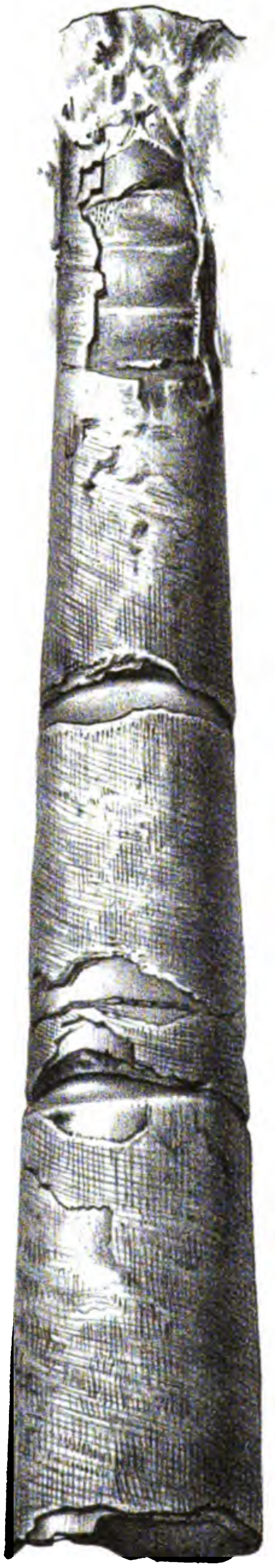
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